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ABSTRACT

A study was conducted to assess the agricultural manpower needs in Michigan in terms of present jobs available and jobs projected over the next five years, to identify and validate competencies needed for agricultural entry upon graduation from high school, and to determine the degree of congruency and discrepancy between the characteristics of the present programs of vocational agriculture and the evidence of need based on manpower needs, competencies needed, and student interests and aspirations in agriculture. The methods included were (1) a manpower needs assessment survey of three major occupational areas; (2) the identification and validation of several hundred competencies; and (3) an in-depth review of all ongoing programs of vocational agriculture in 1973-74, including an assessment of the agricultural interests and aspirations of 4,571 tenth graders in 12 schools. Manpower data were obtained from 144 farm operators, 100 nurserymen, and 50 farm equipment dealers. Projections indicated that, over the next four years, twice as many farmers will be needed than are presently being prepared. Output from high school ornamental horticulture and agricultural mechanics programs will have to increase by 500% and 300%, respectively, per year, if supply is to catch up with the projected manpower needs. The number of students with interest in avocational and vocational instruction in agriculture was far in excess of the enrollment in vocational agriculture. (Author/HD)

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AGRIBUSINESS AND NATURAL RESOURCES EDUCATION IN MICHIGAN

- Manpower Needs
- Competencies Needed
- School Program Characteristics

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A FINAL REPORT

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August, 1975

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CE 008 431

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Sandi L. Bauer, Agriculture and Natural Resources Education Institute --Project Secretary.

Project Advisory Council Members

A ten-member advisory council, consisting of Michigan agribusinessmen and educators, was formed with the cooperation of the Michigan Department of Education at the project outset. The council served as a useful source of consultation and assistance to the project staff throughout the duration of the study. The council members are listed in Appendix J.

Data Collection Field Coordinators

Fourteen teachers of vocational agriculture assisted in the collection of task analysis field data. The teachers were selected on the basis of proximity to the area of the state where employment in the selected occupational clusters is concentrated. The teachers are listed in Appendix K.

Participant Schools

Nearly three-quarters of the high schools in Michigan offering vocational agriculture responded to the survey of local program characteristics. In addition, twelve Michigan high schools participated in at least one of the two surveys conducted to assess student interests and aspirations in agriculture. The twelve participant schools are identified in Appendix L.

Interest Survey Assistance

Harcourt Brace Jovanovich, Inc. granted a substantial research allowance on the purchase of all Ohio Vocational Interest Survey materials used in the study and provided technical assistance in the special processing of the OVIS data.

Office Space and Equipment

Office space and equipment used in the conduct of the project were provided by the Agriculture and Natural Resources Education Institute, Michigan State University. Computer services for processing the task analysis data were provided by the Ingham Intermediate School District Computer Center, Mason, Michigan. The manpower and school program characteristics data were processed by the Computer Laboratory, Michigan State University.

ACKNOWLEDGMENTS

The preceding pages, and the appendices to which they refer, contain the names of several individuals and organizations whose cooperative support has made completion of this study possible. Some specific contributions are worthy of further appreciation and acknowledgment.

The project director extends a sincere thank you to his project staff colleagues, Professors J. Frank Bobbitt, Raymond M. Clark, O. Donald Meaders, and Allen E. Shapley, and Messrs. Marvin L. Klein and Boyd F. Robinson, Jr., for their meaningful contributions and conscientious efforts throughout the study.

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ABSTRACT

Title of Project: Agribusiness and Natural Resources Education in Michigan: Manpower Needs, Competencies Needed, and School Program Characteristics.

Project Director:* William L. Thuemmel

Contracting Agency: Agriculture and Natural Resources Education Institute, and Department of Secondary Education and Curriculum, Michigan State University

Beginning and Ending Dates: April 1, 1974 through August 31, 1975

Purpose.--To assess the agricultural manpower needs in Michigan in terms of present jobs available and jobs projected over the next five years, to identify and validate competencies needed for agricultural entry upon graduation from high school, and to determine the degree of congruency and discrepancy between the characteristics of the present programs of vocational agriculture and the evidence of need based on manpower needs, competencies needed, and student interests and aspirations in agriculture.

Method.--Included were: (1) a manpower needs assessment survey of three major occupational areas; (2) the identification and validation of several hundred competencies by analyses of job tasks in four occupational areas; and (3) an in-depth review of all ongoing programs of vocational agriculture in 1973-74, including an assessment of the agricultural interests and aspirations of 4,571 tenth graders in 12 schools. Manpower data were obtained from 144 farm operators, 100 nurserymen, and 50 farm equipment

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*With the assistance of J. Frank Bobbitt, Raymond M. Clark, Marvin L. Klein, O. Donald Meaders, Boyd F. Robinson, Jr., and Allen E. Shapley.

dealers by telephonic interviews. Contingency tables were computed and tabular comparisons were made between the manpower, program review, and student interest variables.

Findings.--Approximately 45,000 operators and workers were employed full-time on Michigan farms in 1974. Projections indicated that, over the next four years, twice as many farmers will be needed than are presently being prepared in vocational agriculture. During the same period, output from high school ornamental horticulture and agricultural mechanics programs will have to increase by 500 percent and over 300 percent, respectively, per year, if supply is to catch up with the projected manpower needs in the two areas.

The number of students with interest in avocational and vocational instruction in agriculture was far in excess of the enrollment in vocational agriculture.

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CHAPTER I

INTRODUCTION

Background

An expanding worldwide demand for food and fiber and an increasingly cost-conscious and urbanized public are two potentially powerful forces for effecting change in the agricultural education programs of the nation's public schools. Widespread concern for improved energy conservation, increased agricultural production, a cleaner environment, and the wiser use of natural resources in general, has heightened the potential relevance of agricultural education to a large segment of the population. However, despite this concern, communities do differ in their educational priorities and in their ability to support local school programs. Also, in the case of agricultural education, considerable variation exists between schools in both type and quality of program offered. It seems only logical that programs which are well tailored to community needs will flourish and those which are not will atrophy and die from lack of community support.

Because of local economic exigencies and the financial support provided through federal legislation, high school programs of vocational education in agriculture have traditionally accounted for nearly all of the agricultural education offered by the public schools. This vocational program priority continues to be supported by a growing need for employees to fill agriculturally related employment positions in urban as well as rural communities in most parts of the country. However, the problem of meeting this manpower training need becomes increasingly complex and difficult as agriculture becomes more technologically sophisticated and as budgets for vocational education tighten. In short, high school programs of vocational agriculture are currently faced with the challenge of improving both the quantity and quality of their graduates--and of doing both with increased instructional efficacy.

This study was begun in April, 1974 to investigate how the phenomena and concerns presented above applied to Michigan.[1] The findings from this research are to provide a data base for improving and expanding the network of high school programs of vocational education in agriculture throughout the state. Vocational agriculture programs were selected because they constitute the most common formal delivery system for agricultural education (also referred to as agribusiness and natural resources education) in Michigan.

Purpose

The purpose of this study was to assess the agricultural manpower needs in Michigan from employers in terms of present jobs available and jobs projected over the next five years, to identify and validate competencies needed for agricultural job entry upon graduation from high school, and to determine the degree of congruency and discrepancy between the characteristics of the present programs of vocational agriculture and the evidence of need based on manpower needs, competencies needed, and student interests and aspirations in agriculture.

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[1] The study was funded by the Michigan Department of Education, Vocational-Technical Education Service. Dr. Eugene E. Trotter, Assistant Professor, directed the project initially until resigning in August, 1974 to assume a teacher education position in the Department of Secondary Education and Curriculum, College of Education, Michigan State University. The writer assumed the project directorship upon Dr. Trotter's reassignment.

General Objectives

The primary objectives of the study were to seek answers to the following questions:

1. What are the needs from employers in terms of present and emerging agriculturally related jobs and in terms of the number of these jobs available?
2. What are the competencies needed for entrance and advancement in the agriculturally related jobs?
3. What are the congruencies and discrepancies in existing vocational agribusiness and natural resources programs
    a. . . . in terms of jobs available, programs of instruction available and career patterns?
    b. . . . in terms of competencies required for job entry and competencies being developed in the present programs?

Project Design and Procedures

The study consisted of three structurally separate but conceptually interdependent components and major activities: (1) Part One (Manpower Needs), a manpower needs assessment survey; (2) Part Two (Competencies Needed), an analysis of job tasks; and (3) Part Three (Program Review), an in-depth review of reimbursed ongoing programs of vocational agriculture including an assessment of the agricultural interests and aspirations of high school tenth graders.[2]

Research coordinators were assigned to each of the three project components to conduct the necessary surveys, analyze their data, and report on the findings from their particular area of responsibility. The project director was responsible for the general administration of the investigation, coordination of the use of the Ohio Vocational Interest Survey, and preparation of the Final Report. General administration included the synchronizing of coordinator efforts to enhance the possibility of identifying congruencies and discrepancies between the three separate sets of findings.

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[2] Although initially a portion of Part Three (Program Review), student interest in agriculture is presented as a separate chapter of this report.

Part One (Manpower Needs)

Four major occupational clusters in the Michigan agricultural work force were identified through an analysis of census data for 1969 and 1970. The clusters included: (1) Agricultural Production (farming); (2) Environmental Horticulture; (3) Farm Implement Repair; and (4) the Biological-Technical Services in Agriculture.[3] Primary manpower data were obtained via structured telephonic interviews with a representative statewide sample of farm operators, ornamental horticulture entrepreneurs, and farm equipment dealers. Current and projected manpower needs for three of the four occupational clusters were estimated from primary data. Manpower needs for the Biological-Technical Services in Agriculture and other occupational areas in agriculture were estimated from secondary data sources. Information about job characteristics was limited primarily to jobs in Agricultural Production.

Part Two (Competencies Needed)

A task analysis process was used to identify job competencies needed by beginning workers for entry and advancement into each of the four previously designated occupational areas. The process first involved the compilation of task (skill and knowledge) inventories or lists by university specialists in each area, followed by a review of each list by employers in appropriate businesses and industries. Revisions were made where necessary. The revised lists were then submitted to workers in 21 selected industries (within the four occupational clusters) for validation. Finally, the worker responses were summarized and tabulated by computer.

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[3] The four major occupational clusters are formally defined in the glossary.

Job skills and job knowledges were evaluated as "accepted" or marked for "review" (rejected) on the basis of the percentage of respondents who indicated the task was "entry level" or "essential" for beginning workers. Accepted job tasks within an occupational cluster which were common to all surveyed industries were identified as were those which were industry specific.

Part Three (Program Review)

A variety of survey instruments, sources, and techniques were used to conduct a comprehensive review of the 181 reimbursed programs of vocational agriculture in Michigan during 1973-74. The schools involved provided data about their vocational agriculture program components, curricula, objectives, facilities, teacher assignments, student selection criteria, and other related items. Student vocational agriculture enrollments by program area, occupational experience data, and related information were secured from Michigan Department of Education records. Both follow-through and follow-up studies were completed on former vocational agriculture students from the Class of 1973, in six selected schools, to analyze student occupational training and employment patterns.

Student Interest in Agriculture.--The Michigan Occupational Preference Survey in Agriculture (MOPSA) was administered to tenth grade students in vocational agriculture to identify the group(s) of agricultural occupations in which they were most interested. In a related survey, the Ohio Vocational Interest Survey (OVIS) was used to measure and compare the vocational interests and aspirations of tenth graders in schools offering vocational agriculture with those not offering such instruction.

Contingency tables were computed between the independent variables of school size, geographical location, and community type and each of the previously mentioned Part Three (Program Review) and student interest variables.

Congruencies and Discrepancies.--Tabular comparisons were made between the data on manpower needs, student output in vocational agriculture, and student interest to determine the degree of congruency and discrepancy between Part One (Manpower Needs) and Part Three (Program Review). In Part Two (Competencies Needed), a higher priority was placed on identifying the competencies required than on comparing them with those reported in the manpower surveys of Part One and by teachers of vocational agriculture in Part Three. Consequently, comparisons between Part Two and the remaining components were limited by design.

Assumptions

The following are the basic assumptions under which the study was conducted:

1. The populations of farms and agricultural firms surveyed in both the manpower and task analysis portions of the study were representative of Michigan agriculture.
2. Valid and reliable data would be elicited by the interviewers and supplied by the teacher respondents in using the interview schedules developed.

3. Agricultural education has a responsibility for developing and helping to develop educational programs--instruction, vocational guidance and counseling--that will enable children, youths, and adults to prepare for occupational roles in agriculturally related careers as well as satisfactorily fulfilling agriculturally related personal and avocational roles.
4. Programs of vocational education in agriculture should be developed in response to demonstrated needs, including both employment opportunities and student vocational interests in agriculture.
5. Because of the interdependencies of manpower needs, job competencies needed, and an appropriate delivery system for bridging the gap between agricultural manpower supply and demand, a comprehensive study involving all three components is the best approach toward bringing the triad into balance.
6. Although there exist several post-secondary occupational training programs in agriculture in Michigan, their combined annual output of program graduates was estimated at only 250 for 1974-75. Therefore, because of the small number of such individuals relative to those enrolled in programs of vocational agriculture, it was assumed that exclusion of the post-secondary delivery system in agricultural education from this study did not constitute a serious limitation to the findings herein.

Limitations

Despite the broad scope of the study, certain limitations were experienced regarding its comprehensiveness. The principle limitations were:

1. Although census data were included to add comprehensiveness to some portions of this report, the study itself was limited to four major occupational clusters, only three of which were included in the manpower survey.
2. Since the study was conducted during a period of rapid economic change, it was difficult for employers to accurately predict their future manpower needs.
3. The nature of the study and its subsequent design precluded detailed analyses of possible congruencies and discrepancies between competencies needed for job entry as perceived by relevant job holders and competencies presently being developed by students in programs of vocational agriculture.
4. Job task analyses were restricted to the cognitive (knowledge) and psychomotor (skill) competencies only. Because of their inherent difficulty for analysis, affective (attitudinal and judgmental) tasks were excluded from the study.

Definitions of Terms

The key terms used in this study were underscored when they made their first substantial appearance in the text. If such terms were undefined at their point of introduction or unclear in the context in which they were used, then clarification of their intended meaning was accomplished through formal definition. The defined terms were placed in the Glossary.

Review of Related Research

A review of research conducted in Michigan and in other states revealed a wide array of studies dealing with employment opportunities and/or competencies needed for entry into agricultural (primarily non-farm) occupations. However, statewide assessment studies of vocational agriculture programs and studies of student vocational interest in agriculture were both found to number very few.

After a thorough search of research summaries on file with the National Institute of Education's Educational Resources Information Center (ERIC), the U.S. Department of Agriculture's Current Research Information System (CRIS), and the Michigan State University libraries, the writer concluded that this study was indeed unique. No previous study was found that included a comprehensive analysis of agricultural education programs and their relationships to agricultural manpower needs and job competency requirements on a statewide basis. The inclusion of student interests and aspirations in agriculture added further to the uniqueness (and hopefully to the usefulness) of this particular study.

Overview

The general objectives of the research project and their part-specific sub-objectives form the structure for the six remaining chapters of the report. Due to the relatively discrete, tripartite structure of the project, the specific objectives, methodologies, and findings of each of the three basic components are presented separately in Chapters II, III, and IV. Related findings are reported in the remaining chapters.

Chapter II contains the information about manpower needs--the manpower needs assessment portion of the project (Part One)--and Chapter III deals with the competencies needed--the job task analysis component of the study (Part Two). Because of the voluminous amount of technical data generated from the job task analysis part of the study, the lists of several hundred validated tasks or competencies from this component were excluded from this report. Instead, the data were compiled into 100 tables and printed separately under the title Agribusiness and Natural Resources Education in Michigan: Job Competencies Needed (hereinafter referred to as the Tabular Supplement).

Chapter IV contains most of the program review component of the project (Part Three). The portion of Part Three concerning student interests in agriculture is presented separately as Chapter V.

The relationships between the three major components of the study (manpower needs, competencies needed, and programs of vocational agriculture) and student interests and aspirations in agriculture are dealt with in Chapter VI. A summary of major findings is presented in the final chapter; in addition, conclusions are drawn and recommendations are made for programming at both the state and local levels.

CHAPTER II

MANPOWER NEEDS

Objective Question 1: What are the needs from employers in terms of present and emerging agriculturally related jobs and in terms of the number of these jobs available?

This chapter contains information about the manpower needs assessment portion of the project (Part One) and was organized in response to Objective Question 1 above.[1] The concept "demand from employers" as stated in the primary objective was interpreted to mean "manpower needs" (see Glossary). "Agricultural manpower in Michigan" included persons engaged in a variety of farming enterprises as well as those gainfully employed in a wide range of non-farm agricultural industries.

The writer was unaware of any recent studies that have dealt with the total agricultural labor force in Michigan. Some Michigan manpower data were available from the 1969 Census of Agriculture and the 1970 Census of Population. These data and labor data gathered by the Michigan Crop Reporting Service were cited later in the report.

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[1] Most of the content of Chapter II was adapted from data and materials submitted to the project director by Drs. J. Frank Bobbitt and Allen E. Shapley in fulfillment of their responsibilities as co-coordinators of the manpower needs component of the study. Mr. Marvin L. Klein assisted Dr. Shapley with the field report on Agricultural Production. See Allen E. Shapley and Marvin L. Klein, Manpower Demand in Agricultural Production, A Report submitted to the Director of the Agricultural Education (Agribusiness and Natural Resources Education in Michigan) Research Project (East Lansing: Department of Agricultural Economics, Michigan State University, March 21, 1975); also J. Frank Bobbitt, "Agriculture Manpower Study: Non-Farm Agriculture", Michigan State University, East Lansing, March 1975. (Mimeographed.)

Objectives

To facilitate attainment of the primary objective, three sub-objectives were assigned to the manpower needs component of the study. They were:

1. To identify the agribusiness and natural resources work force in Michigan.
2. To project job trends with priority being given to jobs within the three occupational clusters listed below:[2]
    a) Agricultural Production (farming)
    b) Environmental Horticulture
    c) Farm Implement Repair
3. To determine the job characteristics of the work force in the three selected occupational clusters.

Identification of the work force was accomplished by analyzing the available secondary data and, when relevant, by supplementing with primary data. Both primary and secondary data were used in projecting job trends in the three selected occupational clusters. Job trends in the Biological-Technical Services in Agriculture and in other occupational areas in agriculture were also projected, but from secondary data only. Job and labor force characteristics were determined from primary data, most of which pertained to the work force in Agricultural Production.

Primary Data Collection Methodology

Agricultural Production

Michigan agriculture--for purposes of this study--was categorized into five types: dairy, livestock, fruit, vegetable, and field crop. The five counties that ranked first in the state in each type were then selected. They were: dairy, Sanilac; livestock, Lenawee; fruit, Berrien; vegetable, Van Buren; and field crop, Tuscola.

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[2] Resources available dictated that only limited effort could be expended on the collection of primary data. Consequently, only the three listed occupational clusters were surveyed.

In each of the five counties, 10 farms were selected to represent the type of agriculture in which that county led. An additional 20 farms were chosen to represent the four other types. For example, of the 30 farms selected in Berrien County, 10 were fruit farms and 5 each were dairy, livestock, vegetable, and field crop farms.

The constraints of time and funds precluded the use of statistically accurate sampling techniques. Therefore, with the cooperation of the five extension field staffs, farms were chosen that would be expected to most nearly represent a cross section of farms of the type sought in that particular county. This method resulted in the selection of 150 farms. The researchers were confident that this sample of farms, though not statistical, did accurately represent Michigan farms and farmers in those issues discussed herein. The sample did not provide information on the very small part-time or hobby farms, but it did represent the farms that provided a livelihood to the great majority of full-time (see Glossary) farm operators and workers in Michigan during 1974.[3]

The manpower survey itself was conducted by structured telephonic interview during the summer and fall of 1974. Most respondents were very cooperative and answered the questions without hesitation. From the 150 farms selected there were 144 schedules completed. A copy of the letter of introduction to prospective respondents and copies of the interview schedules that were used in the survey were included in Appendix A.[4]

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[3] Only "full-time" farm operators and workers were included in the estimate of work force size in Agricultural Production. Although a large part of the farm work in Michigan was done by seasonal, part-time, and unpaid family workers, the need for these was not reported here because of their lack of career potential and their decreasing importance over time.

Non-Farm Agriculture

The populations for Environmental Horticulture and Farm Implement Repair--the two occupational clusters included in the survey of non-farm agricultural firms--were obtained from the respective membership lists of the Michigan Association of Nurserymen and the Michigan Farm and Power Retailers Association. The Environmental Horticulture population was augmented with several hundred persons in the turfgrass industry in Michigan whose names appeared on mailing lists maintained by the Department of Crop and Soil Sciences at Michigan State University. Although the three sources did not constitute the entire population of their kinds of firms in Michigan, they did represent very large segments of the state's environmental horticulture businesses and farm implement dealerships.

Samples were drawn from the association membership populations and manpower data were obtained via structured telephonic interviews during the fall of 1974. The survey focused only on the needs of firms for full-time employees who were required to possess competencies in agriculture. The researchers were very careful to include only those individuals who the manager or personnel director felt required some skill or knowledge in agriculture to accomplish his or her job.[5] A copy of the letter of introduction to prospective respondents and a copy of the interview schedule that was used in the survey were included in Appendix B.

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[4] Some of the questions on the interview schedule did not relate directly to the objectives of this study. If the reader wishes to know the responses, not reported herein, he or she may contact either Shapley or Klein (see n. 1).

[5] The researchers felt this was a very restrictive procedure in that a number of employees identified should have had, in the researcher's opinion, a knowledge and skill of agriculture, but the employer did not share this view. Thus, those identified as requiring a skill and knowledge of agriculture was, according to the researchers, a very conservative number.

Environmental Horticulture.--The members of the Michigan Association of Nurserymen and the individuals on the turfgrass mailing list were selected to provide information on the need for environmental horticulture employees in the state. A total of 2,540 employers identified with either the nurserymen association or the turfgrass industry. From this population, a sample of 100 employers was chosen and all were interviewed. The results of the survey were projected to the entire population.

Farm Implement Repair.--Information about the need for farm implement repairmen was obtained from members of the Michigan Farm and Power Retailers Association. This organization provided a population of 352 dealers. A sample of 50 dealers was selected and all were interviewed. Again, the survey results were projected to the entire population.

Application of Secondary Data

Agricultural Production

Census of Agriculture.--Some information about the farm labor force was recorded in the 1969 Census of Agriculture.[6] Hired workers were divided into two categories--those that were employed less than 150 days and those that were employed 150 days or more. For purposes of analysis in this section only, those that worked 150 days or more and farm operators were both considered as "full-time" workers. Operator information was not as well analyzed in the census; however, it was assumed that there was one operator per farm. The number of partnerships was recorded but not the number of partners per partnership.

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[6] U.S., Department of Commerce, Bureau of the Census, Census of Agriculture: 1969, vol. 1, Area Reports, pt. 13, Michigan, sec. 1, "Summary Data" (Washington, D.C.: Government Printing Office, 1972), p. 112.

Some assumptions had to be made in order to estimate the size of the "full-time" labor force in Agricultural Production in 1969 from Census of Agriculture data. Assumptions made by the researchers were:

1. Only workers working 150 days or more were "full-time" workers.
2. "Individually owned" and "other" businesses had one operator each.
3. "Partnerships" and "corporations" averaged two operators each.
4. "Off-farm work" by operators did not count against their "full-time" status (i.e., all operators were "full-time" operators).
5. Only the operators in Economic Classes I-IV were included.

Assumptions 1 and 2 were self-explanatory except for the inclusion of "other" in the latter. Since there were only 94 "other(s)" and they were concentrated in Economic Classes III and IV, it was assumed they were single operators. Assumption 3 was based on the knowledge that the large majority of farm partnerships and corporations have two operators. The few that were larger were most likely offset by those that had non-working partners or shareholders. Assumption 4 was based on the fact that operators with off-farm work still require knowledge of agriculture. Assumption 5 was based on the opinion that only those farms with $5,000 or more in gross sales should qualify as commercial businesses.

Applying the above assumptions to the census data, the farm labor force in 1969 was 45,887. This is illustrated in Table 1.

Census of Population.--The 1970 Census of Population has been analyzed in detail by the Economic Research Service of the U.S. Department of Agriculture as it pertained to employment in agricultural and agribusiness occupations. Two categories of the employment figures presented were pertinent to this report--those in Section I-"Occupations that Require or Utilize Agribusiness Competencies in Any Industry Where Hired" and those

Table 1.--Employment in Agricultural Production, Census of Agriculture, Michigan, 1969.

Farms by Economic Class/ Gross Sales in Dollars	Individually Owned and Other	Partnerships and Corporations	Total Number of Operators[a]	No. Employees with 150 Days or More of Work
	No. of Farms	No. of Farms		
IA - 100,000 or more	382	354	1,090	3,670
IB - 40,000 - 99,999	2,344	895	4,134	2,943
II - 20,000 - 39,999	6,213	1,246	8,705	1,996
III - 10,000 - 19,999	8,208	1,074	10,356	784
IV - 5,000 - 9,999	9,883	1,004	11,891	318
Total	27,030	4,573	36,176	9,711

Total Labor Force . . . . 36,176 Operators + 9,711 Employees = 45,887

SOURCE: Compiled by Shapley and Klein from U.S., Department of Commerce, Bureau of the Census, Census of Agriculture: 1969, pp. 29, 112.

[a] It was assumed that individual and "other" farms had one operator per farm; partnerships and corporations, two per farm.

in Section II-"Occupations that Require or Utilize Agribusiness Competencies Only in Selected Industries".[7]

The Census of Population data were gathered during the month of March and were based on the chief activity or primary occupation that the respondent was engaged in during the survey week. This approach would have eliminated many of the 17,000 farmers that reported 100 or more days of off-farm work in the 1969 Census of Agriculture. Also, the March date may have missed some of the employed workers reported in the 1969 Census of Agriculture that worked 150 days or more. For these reasons the population census data were not directly comparable with the agricultural census data but instead was another approach at determining the size of the labor force in Agricultural Production.

A summary of the 1970 Census Population data is shown in Table 2. The data indicate that the total full-time labor force on Michigan farms in 1970 was 40,962.

Crop Reporting Service.--The Michigan Crop Reporting Service sends out approximately 2,000 questionnaires per month to Michigan farmers requesting information on, among other things, the labor force. This information is published annually in Michigan Agricultural Statistics. Also, this same information, and similar data from other states, is published by the U.S. Department of Labor in a monthly report entitled Farm Labor.

It was impossible to make any close comparisons between the agricultural and population census data and the Michigan Crop Reporting Service data. This was due in part to the definition used for a hired worker, and in part due to the failure to separate operators from family labor.

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[7] U.S.,Department of Agriculture, Economic Research Service, Employment in Agricultural and Agribusiness Occupations: Region 5, ERS-575, October, 1974, pp. 34-43, 83-88.

Table 2.--Employment in Agricultural Production, Census of Population, Michigan, 1970.

Occupation	Class of Worker		Total
	Private	Self-Employed	
Section I:			
Agricultural Scientist	5	5	10
Agri., Biological Technician .	6	6	12
Farm Implement Repairman . . .	22	-	22
Farmer (owner or tenant) . . .	-	27,996	27,996
Farm Manager	1,208	-	1,208
Farm Foreman	215	-	215
Farm Laborer	11,152	95	11,247
Farm Service Laborer	-	28	28
Section II:			
Biological Scientist	6	-	6
Personnel Worker	6	-	6
Misc. Clerical Worker	10	-	10
Inspector	10	-	10
Truck Driver	162	30	192
Total Labor Force			40,962

SOURCE: Compiled by Shapley and Klein from USDA, ERS, Employment in Agricultural and Agribusiness Occupations: Region 5.

The data, as published, gave the number of workers on farms by months (see Appendix C). A hired worker was one employed "during the last full calendar week ending at least one day before the end of the month".[8] The only way one could make an estimate of the number of full-time employees was to assume that those working during the winter months were full-time. Using this assumption, the average number of full-time employees on Michigan farms during January, February, and December of 1973 was 13,000. In 1970, the figure for these three months was 14,000 and this compared fairly close with the 1970 Census of Population total of 12,575 for farm laborers, foremen, and hired managers.

Since operators and family labor were reported as one, there was no way to estimate the number of operators from these data.

Non-Farm Agriculture

Secondary data were also used to help identify the non-farm agricultural work force in Michigan: however, they were reported only in brief. Two of the sources reviewed were County Business Patterns, 1970: Michigan, (see Appendix D)[9] and Employment in Agricultural and Agribusiness Occupations: Region 5. Data from both sources are shown in Table 3. The data which tend most to correspond with the primary data collected by the researchers (see Table 7) were those presented in Employment in Agricultural and Agribusiness Occupations.[10] This publication has resulted from several years of work by individuals associated with four departments of the United States Government and was found to be the most reliable secondary source of agricultural manpower data available.

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[8] Michigan Crop Reporting Service, Michigan Agricultural Statistics: 1974 (Lansing: Michigan Department of Agriculture, June, 1974), p. 50.

[9] U.S., Department of Commerce, Bureau of the Census, County Business Patterns, 1970: Michigan, CBP-70-24, pp. 12-20.

[10] USDA, ERS, Employment in Agricultural and Agribusiness Occupations: Region 5.

Table 3.--Employment in Non-Farm Agricultural Occupations, Secondary Data Sources, Michigan, 1970.

Non-Farm Agricultural Occupations by U.S. Office of Education Program Code[a]		County Business Patterns CBP-70-24	Employment in Agricultural and Agribusiness Occupations ERS-575
01.02	Agricultural Supplies/Services	5,556	2,308
01.03	Agricultural Mechanics	8,175	2,164
01.04	Agricultural Products	32,896	19,127
01.05	Ornamental Horticulture	4,386	12,577
01.06	Agricultural Resources	231	284
01.07	Forestry	16,509	4,188
Total		67,753	40,648

SOURCES: Compiled from U.S., Department of Commerce, Bureau of the Census, County Business Patterns, 1970: Michigan and USDA, ERS, Employment in Agricultural and Agribusiness Occupations: Region 5.

[a] Program code categories "01.01 Agricultural Production" and "01.99 Agriculture, Other" were excluded.

Biological-Technical Services in Agriculture.--An attempt was made to identify from secondary data a group of closely related occupations in various industries that required of its employees a relatively homogenous set of competencies in the application of biological and chemical principles to agriculture. This group or cluster, for purposes of this study, was referred to as the Biological-Technical Services in Agriculture (see Glossary). Unlike the other three clusters identified in the study, this cluster was not limited to any one of the eight major program codes or areas in agriculture which are used by the U.S. Office of Education (USOE).[11] Instead, the Biological-Technical Services in Agriculture overlapped with several of the USOE program areas.

The 1970 Census of Population data were used to help determine the size of the work force in the Biological-Technical Services in Michigan, as shown in Table 3. The data indicate that the total work force in the Biological-Technical Services in Agriculture in Michigan was at least 3,478 in 1970.[12]

The Agricultural Work Force Identified

Secondary data were presented in the previous section to provide a comparative perspective for interpreting the application of the primary data in the following pages.

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[11] See Table 9, p. 33 for a complete list of the USOE program areas in agriculture.

[12] Some occupational categories such as "veterinary assistants", considered within the Biological-Technical Services in Agriculture cluster, were not clearly identified in the Census of Population data. Also, some employees in the waste disposal and water resources industries may have been missed for similar reasons.

Table 4.--Employment in the Biological-Technical Services in Agriculture, Census of Population, Michigan, 1970.

Occupation	Total
Section I:	
Agricultural Scientist (food and related products)	5
Agricultural and Biological Technician (except health)	1,067
Animal Caretaker (except farm)	1,463[a]
Section II:	
Biological Scientist (other than Agricultural Production)	23
Chemist	182
Chemical Technicians	47
Inspector	43
Checker, Examiner, or Inspector; Manufacturing	648
Total Labor Force	3,478

SOURCE: Compiled by author from USDA, ERS, Employment in Agricultural and Agribusiness Occupations: Region 5.

[a] Veterinary assistants were not clearly identified in the census data and probably were excluded from the total.

Agricultural Production

The primary data included the size, composition, and characteristics of the labor force on a representative sample of Michigan farms. These data were categorized by economic class so that they could be equated to Census of Agriculture data presented earlier.

The sample of farms was divided into classes that corresponded somewhat to the "economic classes" of the Census of Agriculture. Those classes were as follows:

1. IA--farms with $100,000 or more in gross sales;
2. IB--farms with $40,000 to $99,999; and
3. II--farms with less than $40,000 gross sales.

The latter group was originally designed to represent Economic Classes II to V, but all the farms fell into the $20,000 to $39,999 sales category, so they represented Class II only. No data were gathered on small farms.

Considerable data were collected on family, seasonal, and part-time labor, as well as operator and full-time. However, for reasons stated earlier, only the operator and full-time employer labor were considered in the estimate of manpower needs in Agricultural Production.

The 144 sample farms consisted of 103 single operator businesses and 41 partnerships, resulting in a total of 202 operators. There were 118 full-time employees on the 144 farms with 91 of the farms having no full-time workers. The categorization of these data into economic class is shown in Table 5.

Table 5.--Farms, Operators, and Full-Time Workers by Economic Class, 144 Michigan Farms, 1974.

Farm by Economic Class/ Gross Sales in Dollars	Number of Farms	Number of Partnerships	Number of Operators	Operators per Farm	Number of Full-Time Workers	Full-Time Workers per Farm
IA- 100,000 or more	64	24	101	1.6	107	1.7
IB- 40,000 - 99,999	53	15	72	1.4	11	.2
II- 20,000 - 39,999	27	2	29	1.1	0	0

SOURCE: Primary data, Shapley and Klein.

The operators and workers per farm were multiplied by the number of farms in the state to arrive at another estimate of total employment in Agricultural Production. The most recent figures for number of farms were developed for 1973 by Professor Karl T. Wright at Michigan State University. Dr. Wright is an expert Census of Agriculture analyzer and interpreter. His 1973 figures were developed from many sources including the 1969 Census of Agriculture, 1973 sample data from other states, and the Michigan Crop Reporting Service, to name a few. His estimates have been reviewed by others in the field and approved.

The 1973 figures may be considered relevant to the situation in 1974 since the Crop Reporting Service data, shown in Figure 1, indicate that the total number of farms in Michigan has not changed measurably since 1973.

The number of farms in Economic Classes I-IV as developed by Professor Wright are shown in Table 6. These figures were then multiplied by the respective "per farm" figures from the primary data to arrive at an estimate of total full-time employment in Agricultural Production.

The total labor force of 47,200 was higher than either of the two census totals presented in the previous section. This was explained in part by a strong trend toward farm partnerships where the partner replaces family, seasonal, and/or part-time labor. Also, many of the 14,000 operators on Class III and IV farms included in this figure most likely had full-time off-farm jobs. These would have been excluded from the 1970 Census of Population-based figures.

Adding the number of operators based on the primary data and Wright's figures to number of hired workers reported by the Michigan Crop Reporting Service for 1973 resulted in a total employment of 53,700 (40,700 operators

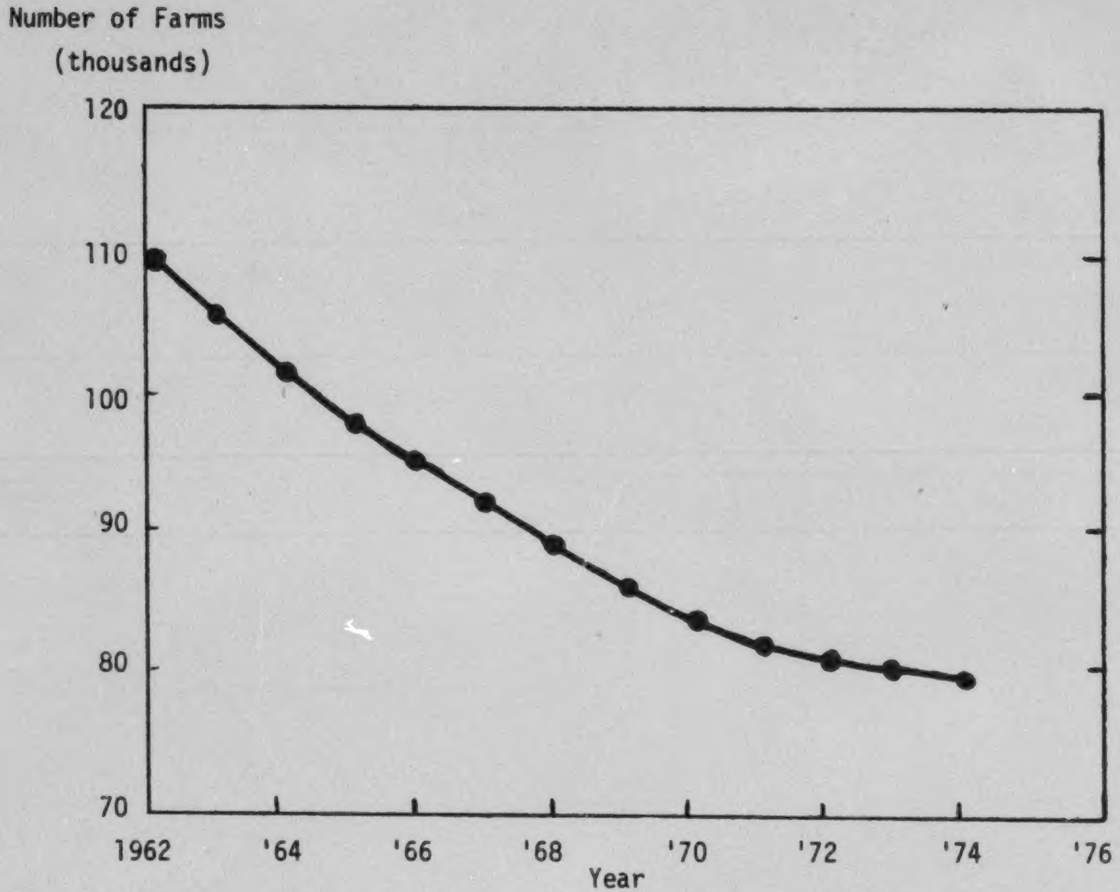

Figure 1.--Number of Farms, Michigan, 1962-74.

SOURCE: Adapted from Michigan Crop Reporting Service, Michigan Agricultural Statistics: 1974.

+ 13,000 hired workers in winter). This was the highest estimate and should be considered the least reliable because it definitely included many part-time operators and part-time hired workers.

Given the above data, Shapley and Klein estimated that there were approximately 45,000 full-time jobs in Agricultural Production in Michigan during 1974. There were considerably more people than this total working on farms, but it was not their primary activity and the jobs were not those a high school graduate would be expected to perform.

Table 6.--Employment in Agricultural Production, Primary Data, Michigan, 1974.

Farms by Economic Class/ Gross Sales in Dollars	Number of Farms 1973[a]	Operators per Farm[b]	Total Operators	Full-Time Workers per Farm[b]	Total Full-Time Workers	Total Full-Time Employment
IA- 100,000 or more	3,000	1.6	4,800	1.7	5,100	9,900
IB- 40,000 - 99,999	7,000	1.4	9,800	.2	1,400	11,200
II- 20,000 - 39,999	11,000	1.1	12,100	0	-	12,100
III- 10,000 - 19,999	7,000	1.0	7,000	0	-	7,000
IV- 5,000 - 9,999	7,000	1.0	7,000	0	-	7,000
Total Labor Force			40,700	. . . + ...	6,500	= 47,200

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[a] Estimates developed by Karl T. Wright, Department of Agricultural Economics, Michigan State University, East Lansing, Michigan, unpublished data.

[b] From primary data, Shapley and Klein (see Table 5 for details).

A comparison of the various estimates of the work force size in Agricultural Production as presented in this chapter can be made from the summary data shown in Table 7.

Table 7.--Estimates of Agricultural Production Work Force Size in Michigan by Data Source.

Source of Data	Full-Time Employees	Farm Operators	Total Number
1969 Census of Agriculture	9,711	36,176	45,887
1970 Census of Population	12,966	27,996	40,962
Crop Reporting Service (1973)	13,000	No Data	No Data
Primary Data (this project)	6,500	40,700	47,200
Estimate by Shapley and Klein	-	-	45,000[a]

[a] The most accurate estimate of work force size in the opinion of the writer.

Non-Farm Agriculture

The primary data for the non-farm sector included the estimated size, composition by job title, and selected characteristics of the agricultural work force in the Environmental Horticulture and Farm Implement Repair Occupational clusters in Michigan during 1974. Data regarding the need for additional full-time employees were also obtained. Only the primary data on size of work force are reported in this section.

Environmental Horticulture.--The 100 employers in the Environmental Horticulture sample represented the landscaping, nursery, and turfgrass industries, but not the retail florist trade. Projections based on the results of the completed interviews indicated there were 24,152 people employed in occupations within the Environmental Horticulture cluster. The respondents felt that 10,073 of their employees required a knowledge and skill of agriculture. The 10,073 were classified by job title into seven categories:

Job Title Classification	Number Needing Agricultural Competencies
Managers	1,999
Superintendents	665
Salespersons	672
Planters, Trimmers, and Related Titles	5,185
Gardeners and Groundskeepers	888
Landscapers and Landscape Technicians	427
Equipment Operators	237

Farm Implement Repair.--Projections based on the responses of the 50 farm equipment dealers in the Farm Implement Repair cluster indicated there were 3,062 people employed in the farm equipment service industry. The dealers felt that 1,991 of their employees required agricultural skills and knowledges. The 1,991 were classified by job title into the categories as listed:

Job Title Classification	Number Needing Agricultural Competencies
Managers	387
Mechanics	915
Parts Clerks	246
Salespersons	197
Set-up Men	204
Service Managers	21
Shop Foremen	21

The Agricultural Work Force: A Summary

A total agricultural work force of 57,064 was identified from the primary data collected in this study. This population represented the number of individuals who required a knowledge and skill of agriculture for their work in one of three occupational clusters during 1974.

In order to more fully identify the total agricultural work force in Michigan, it was necessary to rely on secondary data to account for the occupational areas not surveyed. This information was obtained from the 1970 census data reported in Employment in Agricultural and Agribusiness Occupations. The project findings for the three occupational areas closely paralleled the 1970 census data, as shown in Table 8. The slightly larger figures for the project findings were attributed to moderate growth in the surveyed occupations since the 1970 census was taken.

The agricultural work force data were also summarized by comparing the project findings with the 1970 census data on the basis of the USOE program area code, as shown in Table 9. Both the census data and the project findings indicated that approximately one-half of the agricultural work force in Michigan is still engaged in Agricultural Production.

A conservative estimate of the size of the total agricultural work force in Michigan in 1974 was made by combining the project findings for the three surveyed occupational areas for 1974 with the 1970 census data for the four unsurveyed occupational areas, as shown in Table 13 (page 42). The employment total of 90,997 referred only to those who required a knowledge and skill of agriculture. This estimate was considered to be a very conservative figure because the census data, in contrast to the primary data, would not have included any of the growth which likely occurred in the unsurveyed areas between 1970 and 1974.

Table 8.--Agricultural Work Force in Michigan by Occupational Clusters Surveyed.

Occupational Cluster or Industry	Number of Full-Time Employees	
	Census Data(1970)	Project Findings(1974)
Agricultural Production:		
-Private and self-employed farm operators and workers only	40,962	45,000
Environmental Horticulture:		
-Excluded retail florists	9,723	24,152 (10,073)[b]
Farm Implement Repair:		
-Included farm machinery and equipment industries, but excluded private and self-employed blacksmiths	2,107	3,062 (1,991)[b]
Biological-Technical Services in Agriculture	3,478[a]	No Data
Areas Not Surveyed:		
-Included retail florists, blacksmiths, and many others	30,455	No Data
Total	86,725	(57,064)[b]

SOURCE: Primary data from Shapley, Klein, and Bobbitt. Census data were compiled by author from USDA, ERS, Employment in Agricultural and Agribusiness Occupations: Region 5.

[a] Included agricultural and biological technicians (except health), animal caretakers, agricultural chemists, and related checkers, examiners, and inspectors.

[b] Number of employees needing agricultural skills and knowledges.

Table 9.--Agricultural Work Force in Michigan by U.S. Office of Education Program Code.

USOE Program		Number of Full-Time Employees	
Code	Area	Census Data(1970)	Project Findings(1974)
01.01	Agricultural Production	45,683[a]	45,000[b]
01.02	Agricultural Supplies/ Services	2,308	No Data
01.03	Agricultural Mechanics	2,164	1,991[c]
01.04	Agricultural Products	19,127	No Data
01.05	Ornamental Horticulture	12,577	10,073[d]
01.06	Agricultural Resources	284	No Data
01.07	Forestry	4,188	No Data
01.99	Agriculture, Other	394	No Data
	Total	86,725	(57,064)[e]

[a] Includes private and self-employed farm operators and workers plus farm service advisors, animal caretakers (non-farm), unpaid family workers (farm laborers), and government workers in agricultural production.

[b] Private and self-employed farm operators and workers only.

[c] Blacksmiths excluded; number of employees needing agricultural skills and knowledges.

[d] Retail florists excluded; number of employees needing agricultural skills and knowledges.

[e] Number of employees needing agricultural skills and knowledges.

Projected Job Trends

The agricultural manpower needs for Michigan were projected through 1979 from primary data for the three surveyed occupational clusters. Projections were also made for the unsurveyed occupational areas by applying the statewide average employee replacement rate of 3.46 percent per year to the 1970 census data for the agricultural occupation areas not surveyed.[13]

Agricultural Production

Past trends in the secondary data would suggest that the demand for full-time employees on Michigan farms will remain relatively constant over the next five years and that an increase in the number of operators on large farms will at least balance off the loss of operators due to small farms going out of business. However, the farmers in the sample indicated that projections based on these past trends may not be correct. As illustrated in Table 10, farm operators projected a 74 percent increase in manpower needs on their farms by 1979, with dairy farmers projecting a 100 percent increase. Even if this increase were discounted somewhat to account for optimism--"desirable needs" versus "effective demand" and other factors--the discounted increase would still be substantial.

The data in Table 10 should be viewed with considerable caution. Although they indicate that there will be an average of 1.4 full-time employees per farm by 1979, the median number projected per farm was 0. Also, to project a figure based only on the sample responses would suggest:

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[13] According to the Michigan Employment Security Commission (MESC), an average of 3.46 percent of the Michigan labor force is replaced each year due to labor force separation (deaths, retirements, withdrawals to raise families, etc.).

1. The necessary elimination of virtually all the seasonal workers and most of the unpaid family labor; and
2. The bringing of many acres of new land into cultivation.

Although evidence was found that "item 1" (above) was happening, seasonal workers will not be eliminated by 1979 and there was no evidence of "item 2" occurring; in fact, there was evidence that land is going out of agricultural use.

The actual number of workers on farms in 1979 will depend considerably on several factors such as the price level, the general economic climate, technology not yet invented, and public policy. However, given the present state of the arts and the available data, the researchers would project that by 1979 the full-time farm labor force will be at least 45,000 and possibly as high as 65,000 people. Based on this projected range of expansion, a mean figure of 55,000 was selected for manpower planning purposes in Agricultural Production.

In order to attain the projected expansion of 10,000 in the farm work force by 1979, an average of 2,000 additional full-time farmers will be needed in each of the intervening years. The 2,000 would be in addition to the number of farmer replacements who are needed each year just to maintain the farm labor force at its 1974 size of 45,000. If the statewide average replacement rate of 3.46 percent were applied to the farm labor force, an estimated 1,557 farmers would be required annually to replace those who separate from the labor force each year. It would appear that a total of approximately 3,500 new full-time farmers will be needed each year if the farm labor force is to attain its projected size of 55,000 by 1979.

Table 10.--Present and Projected Needs for Full-Time Workers by Type of Farm, Michigan, 1974.

Item	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
Number of farms in sample	144	31	34	29	25	35
Present:						
Percentage of farms with full-time workers	37%	29%	33%	59%	36%	28%
Average number per farm (on those with)	2.2	1.8	1.3	2.1	4.4	1.6
Average number per farm (all farms)	.8	.5	.4	1.2	1.6	.5
Five-Year Projection[a]						
Percentage of farms with full-time workers	47%	48%	42%	69%	40%	37%
Average number per farm (on those with)	3.0	2.1	1.6	3.6	5.9	2.1
Average number per farm (all farms)	1.4	1.0	.7	2.4	2.4	.8
Percentage of Change Over Present	- - - - - - -	- - - - - - -	- - - - - - -	Percent	- - - - - - -	- - - - - - -
Farms with full-time workers	+28	+67	+25	+18	+11	+30
Number of full-time workers	+74	+100	+60	+97	+48	+69

SOURCE: Primary data, Shapley and Klein.

[a] Based on response to the question: "How many full-time employees do you think you will need on your farm five years from now?"

Non-Farm Agriculture

Environmental Horticulture.--Projected data from employers who were interviewed showed that 10,073 of their employees required agricultural competencies. These same employers also said they could have used an additional 313 workers with agricultural competencies if they had been available at the time of interview. The employers also indicated that they had a normal replacement rate of 720 per year or an annual turnover of 7.15 percent. This represented a total need of 1,033 new employees with agricultural skills and knowledges for 1974-75, as shown in Table 11.

Projections from employer estimates indicated they would need a total work force of 15,410 employees with agricultural competencies by 1979. This represented a 53 percent increase in the work force from its present size and would require 5,337 new full-time workers (1,067 per year) just to fill the jobs created by the anticipated expansion. An additional 3,600 new workers (720 per year) would be needed as replacements to maintain the work force at its present size. In total, the projected data have suggested an average annual need of 1,787 new workers in Environmental Horticulture for each year until 1980.

Farm Implement Repair.--Projected data from farm machinery dealers who were interviewed indicated that 1,991 of their 3,062 employees required skills and knowledges in agriculture. These same dealers also reported they could have used an additional 597 workers with competencies in agriculture if they had been available on the interview date. Projections from the interview data indicated an average replacement rate of 283 per year or an annual turnover of 14.21 percent. This suggested a total need for 880 new employees with agricultural competencies for 1974-75, Table 11.--Employment of Individuals Needing a Knowledge and Skill of Agriculture in Environmental Horticulture as Reported by Individuals in the Nursery, Landscaping, and Turfgrass Industries.

Job Title Classification	Total Current Employment (1)	Additional Full-Time Needed in 1974-75 (2)	Average Number of Replacements Needed/Year (3)		Total Need for New Employees in 1974-75 (4)	Additional Full-Time Needed by 1979 (5)	Projected Total Employment in 1979 (6)
			No.(a)	%(b)			
Managers	1,999	83	38	1.90	121	1,522	3,604
Superintendents	665	32	135	20.30	167	723	1,420
Salespersons	672	83	58	8.63	141	641	1,396
Planters, Trimmers, and Related Titles	5,185	38	218	4.20	256	1,280	6,503
Gardeners and Groundskeepers	888	58	116	13.06	174	328	1,274
Landscapers and Landscape Technicians	427	19	97	22.72	116	408	854
Equipment Operators	237	0	58	24.47	58	122	359
Total	10,073	313	720	7.15	1,033	5,024	15,410

SOURCE: Primary data, Bobbitt.

NOTE: All data refer to individuals needing a knowledge or skill of agriculture. Columns 1, 2, 3a, and 5 were projected from the sample data to the population (i.e., sum of raw data ÷ sample size X population). Column 3b = Column 3a ÷ Column 1; Column 4 = Column 2 + Column 3a; and Column 6 = Column 1 + Column 2 + Column 5.

as shown in Table 12. The very high demand for qualified persons in the farm machinery industry was attributed to the tremendous upsurge in the demand for agricultural products during the past two years.

Projections based on employer estimates suggested they would need a total work force of 3,171 employees with skills and knowledges in agriculture by 1979, or a 59 percent increase in the work force from its current size. This would require 1,180 new full-time workers (236 per year) to fill the jobs resulting from the anticipated five-year expansion. An additional 1,415 new workers (283 per year) would be needed as replacements just to maintain the work force at its current size! In short, the combined data have indicated a projected average annual need for 519 new workers in Farm Implement Repair during the five-year period.

The Biological-Technical Services in Agriculture.--Since no primary data were available, the best estimate of the size of work force in the Biological-Technical Services in Agriculture in 1974 came from 1970 census data. This estimate was reported earlier as having been at least 3,478 in 1970.

The writer assumed that the employees in the Biological-Techical Services in Agriculture were typical of employees elsewhere in the state. Assuming this, the statewide average employment replacement rate of 3.46 percent was applied to the 1970 work force size. This calculation indicated that 120 new jobs would be needed each year in the Biological-Technical Services in Agriculture to replace those who separate from the labor force. Without primary data it was impossible to determine the number of new jobs available each year that were due to expanding employment opportunities.

Table 12.--Employment of Individuals Needing a Knowledge and Skill of Agriculture in Farm Implement Repair as Reported by Agricultural Machinery and Implement Dealers in Michigan.

Job Title Classification	Total Current Employment (1)	Additional Full-Time Needed in 1974-75 (2)	Average Number of Replacements Needed/Year (3) No.(a)	%(b)	Total Need for New Employees in 1974-75 (4)	Additional Full-Time Needed by 1979 (5)	Projected Total Employment in 1979 (6)
Managers	387	56	29	7.49	85	56	499
Mechanics	915	394	204	22.30	598	373	1,682
Parts Clerks	246	49	7	2.85	56	42	337
Salespersons	197	35	29	14.72	64	35	267
Set-up Men	204	63	14	6.86	77	70	337
Service Managers	21	0	0	0	0	0	21
Shop Foremen	21	0	0	0	0	7	28
Total	1,991	597	283	14.21	880	583	3,171

SOURCE: Primary data, Bobbitt.

NOTE: All data refer to individuals needing a knowledge or skill of agriculture. Columns 1, 2, 3a, and 5 were projected from the sample data to the population (i.e., sum of raw data ÷ sample size X population). Column 3b = Column 3a ÷ Column 1; Column 4 = Column 2 + Column 3a; and Column 6 = Column 1 + Column 2 + Column 5.

Annual Manpower Needs Until 1980

The estimated size of the total agricultural work force in Michigan, based on 1970 census data, was reported previously in Table 9 (page 33) by USOE program area. Reference was also made to the size of the agricultural work force in 1974, when based upon both census and primary data, as shown in Table 13. The data presented in Table 13 summarize the projected job trends and annual manpower needs described thus far and show the numbers of replacements needed each year to maintain the unsurveyed agricultural areas at least at their 1970 census level figures.

The projected data reported in Table 13, indicate that an average of 7,038 new workers with agricultural competencies will be needed each year until 1980 to replace those who separate from the labor force and to fill the jobs created by an expanding agricultural industry. About one-half of the new members of the work force will be needed in Agricultural Production and approximately one-quarter of the new workers will be needed in Environmental Horticulture. Instead of being reported as a separate cluster, the manpower needs for the Biological-Technical Services in Agriculture were included among the appropriate unsurveyed USOE program areas, as listed in Table 13.

Characteristics of the Farm Labor Force

Approximately one-half of the agricultural manpower needs in Michigan were found to be in Agricultural Production. Because of the importance of the farm work force relative to the total agricultural work force, and since only operators and full-time employees were included in determining the size of the farm manpower needs, it seemed appropriate to preface

Table 13.--Projected Annual Manpower Needs in Michigan Agriculture by U.S. Office of Education Program Area, 1975-79.

USOE Program		Numbers Needing a Knowledge and Skill of Agriculture			
Code	Area	Total Employment in 1974	Average Number of Additional Full-Time per Year 1975-79	Average Number of Replacements per Year 1975-79	Combined Total of Additional Full-Time and Replacements/Year 1975-79
01.01	Agricultural Production	45,000(private & self-employed farm operators only)	2,000[b]	1,557[c]	3,557
01.02	Agricultural Supplies/ Services	2,308[a]	No Data	80[c]	80
01.03	Agricultural Mechanics	1,991(blacksmiths excluded)	236	283	519
01.04	Agricultural Products	19,127[a]	No Data	662[c]	662
01.05	Ornamental Horticulture	10,073(retail florists excluded)	1,067	720	1,787
01.06	Agricultural Resources	284[a]	No Data	10[c]	10
01.07	Forestry	4,188[a]	No Data	145[c]	145
01.99	Agriculture, Other	8,026[d]	No Data	278[c]	278
	Total	90,997	3,303	3,735	7,038

[a] Compiled from 1970 census data.

[b] Based on a projected labor force of 55,000 private and self-employed farm operators and workers by 1979.

[c] Based on the Michigan Employment Security Commission statewide average employee replacement rate of 3.46 percent per annum.

[d] Included Agricultural Production (other than private and self-employed farm operators), blacksmiths, retail florists, and Agriculture, Other.

the section on job characteristics with a few characteristics about the farm labor force itself.

The typical commercial farm in Michigan has an operator or two, some family labor, a full-time employee and/or part-time help, and some seasonal labor. The amount of each of these depends on the farm organization, size of family, size of business, and type of farm.

By Size of Business

Some of the primary data were analyzed as they relate to size. It was illustrated in a previous section that there were more partnerships among the large scale farms and, therefore, more operators per farm. It was also shown that larger farms were more apt to employ full-time workers.

The amount of family labor used on the sample farms was found to be inversely correlated to farm size. Class IA farms used .20 man-equivalents of farm labor. Class IB used .29 man-equivalents, and Class II used .33 man-equivalents. Seasonal and part-time labor were more closely associated with type of farm, so their relationship to size was not analyzed.

One other concern of interest relative to the farm labor force as it related to size of business was the amount of off-farm work performed by the operator. As Table 14 shows, operators on Class IA and IB farms had about the same amount of off-farm work. On Class II farms, however, a much larger percentage of operators had off-farm jobs and over one-half of those having off-farm work had full-time equivalent jobs away from the farm.

Table 14.--Off-Farm Work of Operators by Economic Class, Michigan, 1974.

Item	All Farms		Economic Class					
			IA		IB		II	
	No.	%	No.	%	No.	%	No.	%
Total Number of Operators	202	-	101	-	72	-	29	-
Hours of Off-Farm Work:								
0	160	79	85	84	59	82	16	55
1 - 999 . .	24	12	12	12	8	12	4	14
1,000 - 1,499 . .	4	2	1	1	1	1	2	7
1,500 or more . .	14	7	3	3	4	5	7	24

SOURCE: Primary data, Shapley and Klein.

By Type of Farm

The percentage of farms using different kinds of labor is given in Table 15. The most important observations were that:

1. All types of farms used all kinds of labor.
2. Most types used very little full-time labor.
3. Unpaid family labor was still used on many farms.

The composition of the average farm labor force by type is shown in Table 16. Seasonal labor was not included in determining the average size of the labor force of the farm because the farmers could not make an accurate estimate of the total hours of seasonal labor hired during the year.

As shown in Table 16, the operator and his family still constituted the primary work force on Michigan farms. Secondary data suggested that although family labor was still important, its use was declining. The

Table 15.--Percentage of Farms Using Different Kinds of Labor by Type of Farm, Michigan, 1974.

Kind of Labor	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	%	%	%	%	%	%
Unpaid Family	55	58	75	62	52	34
Part-Time	35	42	38	52	20	26
Full-Time	37	29	33	59	36	28
Seasonal	74	55	71	90	84	74

SOURCE: Primary data, Shapley and Klein.

Table 16.--Average Man-Equivalents of Labor on Farms by Type, Michigan, 1974.

Type of Worker	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	- - - - - - - - - - - - Man-Equivalents[a] - - - - - - - -					
Operators per Farm . . .	1.4	1.5	1.4	1.3	1.3	1.5
Family Labor per Farm.	.3	.3	.2	.3	.4	.1
Part-Time Labor per Farm	.4	.4	.4	.7	.3	.2
Full-Time Labor per Farm	.8	.5	.4	1.2	1.6	.5
Total Man-Equivalents per Farm Excluding Seasonal Labor	2.9	2.7	2.4	3.5	3.6	2.3
Number of Seasonal Workers at Peak on Farms Using	26	8	5	41	61	10
Duration: Mode Weeks	2-4	2-4	2-4	5-7	8-10	2-4

SOURCE: Primary data, Shapley and Klein.

[a] Man-Equivalent(ME) = 1 year of work for operator and full-time employee; 12 months work for family labor; and/or 2,500 hours for part-time work.

Crop Reporting Service data indicated that on all Michigan farms, family workers (operator and family) made up 84 percent of the total workers in 1969, but by 1974 this figure had fallen to 73 percent.

Job Characteristics

The characteristics surrounding a job have relevance to future manpower needs, career potentials, and educational programs. When these characteristics are studied relative to type of occupation--or in the case of Agricultural Production, type of farm--they provide more specific information for the above concerns.

Unfortunately, resource constraints prevented the collection of much information about job characteristics in the two non-farm occupational clusters that were surveyed. With the exception of two educational characteristics that refer to non-farm jobs, the findings presented in this section refer only to job characteristics in Agricultural Production.

Agricultural Production

Operators.--The age of operators and their tenure on the various types of farms is presented in Table 17. There seemed to be no significant difference in either of these factors when related to type of farm.

Table 17.--Operator Age and Tenure by Type of Farm, Michigan, 1974.

Items	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crops
Operators Age $\bar{X}$	44	43	47	44	42	45
Years as Operator	--	23	25	21	22	24

SOURCE: Primary data, Shapley and Klein.

The frequency of father-son partnerships on Michigan farms would suggest the possibility of a bimodal distribution of operator ages with one peak around 30 and other around 55 to 60. However, the operators in the study fell into a relatively normal distribution, as indicated in Figure 2.

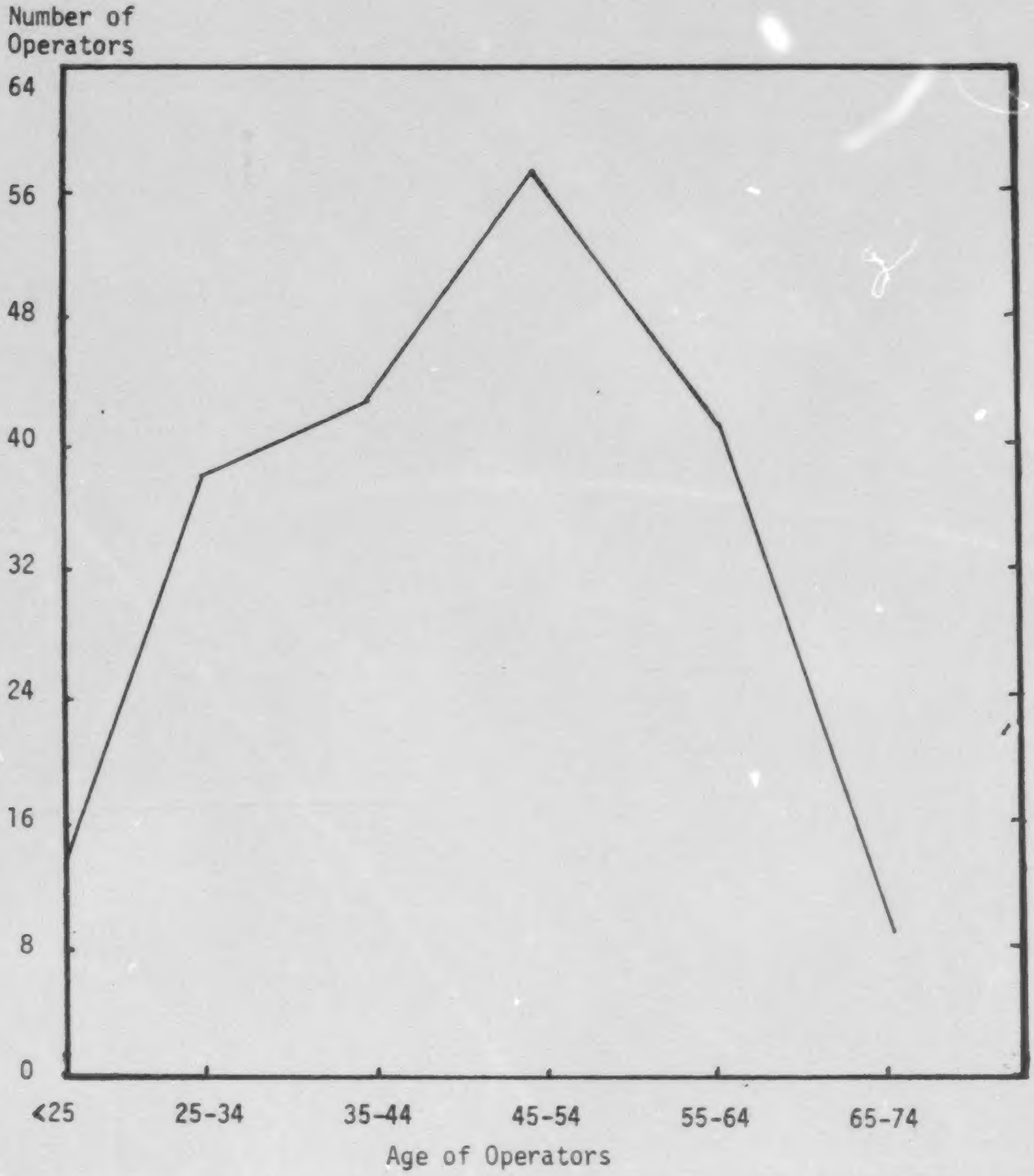

Figure 2.--Frequency Distribution of Operators by Age, Michigan, 1974.

SOURCE: Primary data, Shapley and Klein.

Several of the job characteristics sought concerned farming and formal education. Questions were asked first about the educational background and opinions of the respondents. Although not reported here in tabular form, 85 percent of the farm operators in the survey had completed high school and 45 percent had completed some form of post-secondary education. Eighty-eight percent of the operators had been raised on a farm.

Exactly one-half of the 144 respondents in the farmer survey had taken high school courses in vocational agriculture, as shown in Table 18. Those who had taken such courses were asked "How would you rate courses in vocational agriculture as taught in high schools today in preparing young people for agricultural jobs?" Over one-half of those responding rated today's courses in vocational agriculture as "fair" to "excellent". Only 14 percent rated the present-day courses as "poor", while 30 percent had "no opinion".[14]

The researchers were surprised at the response (also shown in Table 18) which some farm operators gave to the question "Would you be willing to pay a higher starting wage for an applicant for one of the above jobs if he had successfully completed an agricultural education program designed specifically to prepare him for that job?" This question referred to the jobs of additional employees the operator thought he would need five years in the future. It would be difficult to imagine how a rational businessman could answer anything but "yes" to this question. The researchers felt the 89 percent that said "yes" was not nearly as surprising or significant as the 11 percent that said "no".

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[14] The data in Table 18 should be interpreted with considerable caution for the following reasons. The average age of the respondents was in the forties so many rated the program they had been familiar with 25 years ago. Some of those no doubt fell into the "no opinion" category. Others lived in communities where the program of vocational agriculture had been terminated so, although aware of school programs in their community, they had had no recent contact with programs of vocational agriculture. Still others had kept abreast with the changes in vocational agriculture and provided well-informed appraisals.

Table 18.--Farm Operator Responses Regarding Programs of Vocational Education in Agriculture by Type of Farm, Michigan, 1974.

Survey Question	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	%	%	%	%	%	%
Did you take vocational agriculture in high school?	50	65	50	35	40	57
How would you rate vocational agriculture courses today?[a]						
Excellent	12	9	17	15	10	10
Good	28	27	25	8	40	38
Fair	16	23	25	0	10	24
Poor	14	5	8	31	10	14
No Opinion	30	36	25	46	30	14
Would you pay a higher starting wage if applicant had completed agricultural training?[b] . .	89	100	83	88	83	86

SOURCE: Primary data, Shapley and Klein.

[a] Only asked of respondents who had taken vocational agriculture in high school.

[b] This question was asked of all respondents.

Another important job characteristic was the amount and kind of education required. Farmers were asked "How much formal education would be required of your replacement (in the event it should be necessary to fill the operator's position)?" Their responses are shown in Table 19. It was interesting to note that depending on type of farming, between 36 and 60 percent of the respondents felt that a high school education would be adequate for their operator replacement. Education beyond high school was required for operator replacements by 46 percent of the respondents.

Table 19.--Amount and Kind of Formal Education Required of Operator Replacements by Type of Farm, Michigan, 1974.

Responses Regarding Operator Replacements	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	%	%	%	%	%	%
Amount of Formal Education Required:						
- < High School . . .	9	11	6	3	13	12
- High School	44	44	52	33	41	48
- Short Course . . .	29	35	33	26	19	29
- Some College . . .	10	4	6	15	19	8
- Bachelor of Science Degree	7	7	3	21	6	2
Formal Education in Agriculture Required . .	69	65	70	72	75	65
Areas of Agricultural Education Required:						
- Soils	57	52	61	44	69	62
- Livestock, Dairy .	33	63	30	0	13	21
- Agricultural Engineering . . .	47	48	55	36	56	44
- Crops	57	59	70	26	69	65
- Horticulture . . .	25	0	9	69	56	6
- Management	66	63	70	62	72	65

SOURCE: Primary data, Shapley and Klein.

The type of education required of replacement operators was also sought. First, the farmer was asked if he would require his replacement to have had formal education in agriculture. If the response was "yes", then he was asked to answer "yes" or "no" to a list of areas in which the replacement should have this agricultural education. The responses to these questions are also shown in Table 19.

The requirement of education in agriculture and the important areas therein was not correlated with the amount of formal education required. If this correlation were made, it might indicate at which levels the areas of education in agriculture become important.

Next, operators were asked what skills or work experience would be required of their replacement. The respondents were not read a list, instead their responses were recorded and then all responses were categorized after the survey was completed. Table 20 lists the categories and the percentages in each. Fifty-seven percent would require "general farm experience" of their operator replacement.

Finally, respondents were asked to list the major duties of the operator. Like the question on skills, this was open-ended so that the responses would in no way be biased by the interviewer's preconceived ideas.

Table 21 shows the responses as categorized. It was significant that more operators recognized "management" as a major duty than any other. The data also suggested that the operators of fruit farms preferred the most critical tasks themselves (in this case spraying) and had employees do the less critical tasks.

Full-Time Employees.--The average age of the employees in the farmer survey was considerably younger than that of the operators. It was interesting to note that on the type of farms that hired the most workers, the average age of those workers was considerably older than that on other types, as illustrated in Table 22.

Table 20.--Skills or Work Experience Required of Operator Replacements by Type of Farm, Michigan, 1974.

Responses Regarding Operator Replacements	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	%	%	%	%	%	%
Skills or Work Experience Required:						
- General Farm Experience	57	37	79	13	75	83
- Maintenance . . .	23	22	33	21	6	29
- Farm Management .	13	11	15	23	9	10
- Dairy Experience .	10	43	0	0	0	0
- Fruit Farm Experience	8	0	0	44	0	0
- Labor Management .	8	2	0	21	16	4
- Marketing	6	2	6	15	3	4

SOURCE: Primary data, Shapley and Klein.

Table 21.--Major Duties of Operators by Type of Farm, Michigan, 1974.

Major Duties	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	%	%	%	%	%	%
Manage	66	59	79	64	44	81
Machine Operation . . .	60	63	64	21	50	88
Marketing	26	7	18	36	41	31
Maintenance	16	32	18	8	6	17
Spray/Fertilizer	15	0	3	54	28	0
Dairy Herd	10	46	0	0	0	0
Milk	9	37	0	0	0	0
Labor Management	8	0	0	26	13	4

SOURCE: Primary data, Shapley and Klein.

Table 22.--Employee Age and Tenure by Type of Farm, Michigan, 1974.

Item	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	%	%	%	%	%	%
Employee Age $\overline{X}$	33	29	29	38	34	26
Years in This Position	5.2	3.8	2.8	6.3	5.3	5.6

SOURCE: Primary data, Shapley and Klein.

Tenure of employees is also shown in Table 22. It varied considerably by type of farm with those on fruit farms having the longest tenure.

Information on formal education and the skills required of full-time employees was gathered in the same manner as was used to collect similar data on operators (i.e., what would be required of a replacement for this employee?). The summary of this education is presented in Table 23. When compared with the education required for operators, the respondents felt their employees needed less, but a high school education still ranked high. Education beyond high school was required for employee replacements by 21 percent of the respondents.

The skills or work experience required for full-time employment is shown in Table 24. General farm experience was reported as the primary need. This was especially true on dairy and livestock farms.

The major duties of employees at the time of survey are summarized in Table 25. Like the question concerning skills, the question concerning duties was open-ended with responses categorized after the fact. The data indicated that some of the duties were "type specific" but the two most often listed (machine operation and maintenance) were not.

Table 23.--Amount of Formal Education Required of Full-Time Employee Replacements by Type of Farm, Michigan, 1974.

Responses Regarding Employee Replacements	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	%	%	%	%	%	%
Amount of Formal Education Required:						
- < High School . . .	42	25	10	47	63	13
- High School	37	31	60	42	18	69
- Short Course . . .	14	31	30	3	13	13
- Some College . . .	3	0	0	0	8	0
- Bachelor of Science Degree	4	6	0	8	0	6

SOURCE: Primary data, Shapley and Klein.

Table 24.--Skills or Work Experience Required of Employee Replacements by Type of Farm, Michigan, 1974.

Responses Regarding Employee Replacements	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	%	%	%	%	%	%
Skills or Work Experience Required:						
- General farm experience	50	88	90	39	25	75
- Maintenance . . .	22	19	10	20	23	38
- Machine Operation	21	0	30	14	43	0

SOURCE: Primary data, Shapley and Klein.

Table 25.--Major Duties of Employees by Type of Farm, Michigan, 1974.

Major Duties	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	%	%	%	%	%	%
Machine Operation	75	88	90	64	73	81
Maintenance	20	25	20	28	13	19
Prune	19	0	10	50	8	0
Labor Management	16	13	0	42	3	6
Feed Livestock	14	31	60	0	3	25
Spray/Fertilizer	13	0	0	25	13	6
General Livestock	5	6	20	0	3	13

SOURCE: Primary data, Shapley and Klein.

It was hoped that the survey would reveal the hours per year worked by employees. However, due to the numerous and variable time-off arrangements this figure could not be determined. The data on this issue were informative, though, even as they were reported. The average hours worked per day during each quarter was determined. Also, the frequency of various time-off arangements were sought, as shown in Table 26.

The average number of hours worked per day by full-time employees varied by season and by type of farm and ranged from a high of 12.7 for livestock farm employees during spring to a low of 5.3 for vegetable farm employees during the winter months. When type of farm was disregarded, seasonal averages ranged from 10.5 hours for summer to 6.9 hours for winter.

The time-off arrangements for full-time employees also varied greatly and were not always reported exactly as shown in Table 26. For example,

Table 26.--Full-Time Employees, Hours Worked and Time-Off by Type of Farm, Michigan, 1974.

Item	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
Hours Worked Per Day:						
- Winter	6.9	8.8	8.2	6.9	5.3	8.3
- Spring	10.1	11.0	12.7	9.1	9.5	11.5
- Summer	10.5	11.6	10.0	9.0	10.9	10.2
- Fall	10.4	11.1	12.5	9.3	10.0	11.9
Time-Off (Regular):						
- 2 days/week	4	-	-	-	4	-
- 1½ days/week	28	4	2	18	3	1
- 1 day/week	48	9	5	10	13	11
- ½ day/week	7	3	2	1	-	-
- 1½ days every 2 weeks	4	-	1	1	2	1
Only During Slack Times:						
- 2 days/week	1	-	-	1	-	-
- 1½ days/week	6	-	-	-	-	1
- 1 day/week	1	-	-	5	-	1
- ½ day/week	1	-	-	-	1	-
Only When He Asks:	17	-	-	-	17	-

SOURCE: Primary data, Shapley and Klein.

responses falling into the "one-day per week" category included, among others, "after morning chores Saturday until chore time Sunday evening" and two afternoons per week. Approximately 78 percent, however, did indicate having "regular time-off" arrangements with one day off per week being the most typical regular pattern. Eight percent of the respondents reported time-off was granted "only during slack times" and 14 percent "only when he asks".

The wages of full-time employees reported in the study were not analyzed by either type or economic class. However, two values of importance were calculated as follows:

1. The average annual salary of those reporting wages paid by the week, month, or year was $8,568.
2. The average hourly wage of those reporting wages paid by the hour was $2.25.

The benefits provided and their value are shown in Table 27. Less than 60 percent of the full-time employees were receiving paid vacation time and only one-third received any kind of insurance other than that required by law.

Non-Farm Agriculture

Only two questions about job characteristics were sought from employers in the Environmental Horticulture and Farm Implement Repair surveys. Both items referred to formal education and employment in nonfarm agriculture.

The respondents were asked "What is the minimum educational level required for beginning employees (by job title in their agricultural enterprise)?" Their responses were summarized by occupational area, rather than by job title, and are presented in Table 28. Employers in

Table 27.--Kind and Value of Benefits to Farm Employees by Type of Farm, Michigan, 1974.

Benefit	All Farms	Type of Farm				
		Dairy	Livestock	Fruit	Vegetable	Field Crop
	%	%	%	%	%	%
Housing	66	50	70	89	63	38
Utilities	34	38	40	49	28	13
Room and Board	10	19	20	6	3	25
Farm Products	70	75	60	77	75	44
Paid Vacation	57	63	100	60	3	81
Insurance	34	31	20	31	43	31
Other	9	13	10	12	5	6
Average Value of All Benefits	$1,474	$2,008	$2,420	$1,685	$860	$1,483

SOURCE: Primary data, Shapley and Klein.

Farm Implement Repair indicated that nearly all (93 percent) of their jobs required the beginning employee to have at least a high school education; however, the same amount of education was required for significantly fewer (only 71 percent) of the jobs in Environmental Horticulture. The two occupational areas were similar, however, in the percentage of jobs for which some kind of formal post-secondary education was required for beginning employees.

Answers were also sought from employers regarding the question "Would vocational agriculture training be valuable (by job title in their agricultural enterprise)?" The respondents indicated that vocational education in agriculture was valuable preparation for beginning employees for 90 percent of the jobs in Farm Implement Repair and for 80 percent of the jobs in Environmental Horticulture, as reported in Table 29.

Table 28.--Minimum Educational Level Required for Beginning Employees in Environmental Horticulture and Farm Implement Repair.

Minimum Level Required	Environmental Horticulture		Farm Implement Repair	
	No.	%	No.	%
No Minimum	12	8.8	7	5.5
Less than High School	27	19.9	2	1.3
High School	60	44.1	89	61.3
Short Course	23	16.9	39	25.9
Some College	8	5.9	5	3.4
Bachelor of Science Degree	6	4.4	2	1.3
Total	136[a]	100.0	144[a]	98.7

SOURCE: Primary data, Bobbitt.

[a] Denotes total number of jobs for which the respondents reported minimum educational levels.

Table 29.--Respondent Information on the Value of Vocational Education in Agriculture for Beginning Employment in Environmental Horticulture and Farm Implement Repair.

Response	Environmental Horticulture		Farm Implement Repair	
	No.	%	No.	%
Vocational Agriculture is Valuable	101	80.2	131	89.7
Vocational Agriculture is Not Valuable	16	12.7	13	8.9
No Opinion Regarding Value of Vocational Agriculture	9	7.1	2	1.3
	126[a]	100.0	146[a]	99.9

SOURCE: Primary data, Bobbitt.

[a] Denotes total number of jobs for which the respondents reported the value of vocational agriculture.

CHAPTER III

COMPETENCIES NEEDED

Objective Question 2: What are the competencies needed for entrance and advancement in the agriculturally related jobs?

Chapter III is the narrative summary of the competency identification or job task analysis portion of the project (Part Two).[1] Although this chapter was prepared in response to Objective Question 2 above, it does not include the validated competencies needed for entrance and advancement in the agriculturally related jobs. Due to the large quantity of tabular data resulting from the analyses of job tasks and the technical purposes for which the data are intended, the validated tasks or competencies were compiled into 100 tables or listings and presented under separate cover as the Tabular Supplement (see p. 10).[2]

The term "competencies", as stated in the primary objective and used in this study, refers to measurable knowledges or skills which are required of workers within specific job titles (see Glossary). The purpose of the job task analysis component of the project (Part Two) was to develop and validate a list of skills and knowledges (competencies) which are required of workers in agriculturally related jobs. This procedure has proven satisfactory as a means of studying occupations to determine the abilities needed by workers for entry into their chosen occupations.

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[1] Much of the content of Chapter III was adapted from information submitted to the project director by Dr. Raymond M. Clark in fullfillment of his responsibility as coordinator of the competencies needed component of the study. See Raymond M. Clark "Competencies Needed", Michigan State University, East Lansing, June 1975. (Mimeographed.)

[2] The prefix "S" denotes supplementary tables which were included in the Tabular Supplement. These tables were prepared in seven different sets or series (A-G). The "S" prefixed tables were not included in the Final Report.

Many studies to determine the skills and knowledges needed by workers have been completed. Such studies have included requirements for vocational preparation in practical nursing, trades, business, and secretarial work. These studies have listed specific skills and knowledges required of workers in the occupation. The skill and knowledge items in those lists provide a basis for development of performance objectives and for evaluation of accomplishment.

The occupational clusters included in the job task analysis component were derived primarily from a review of the 1970 Census of Population data as analyzed and reported by the Economic Research Service of the U.S. Department of Agriculture.[3] These data are presented by both occupational cluster and USOE program code in Tables 8 and 9, respectively. Also presented in Chapter II are categorical breakdowns of the data included in the Agricultural Production and Biological-Technical Services in Agriculture clusters (see Tables 2 and 4). The numbers of workers involved in agricultural occupations in Michigan, and the importance of these occupations to the economy, provide evidence that educators need detailed analyses of agricultural occupations so that specific educational needs can be met which will prepare students for employment upon graduation from high school.

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[3] USDA, ERS, Employment in Agricultural and Agribusiness Occupations: Region 5.

Objectives

In order to insure attainment of the primary objective, three sub-objectives were established for the task analysis component of the study. They were:

1. To identify the major occupational clusters in Michigan that require or utilize agribusiness and natural resources competencies.
2. To identify the job titles within the selected occupational clusters that require or utilize agribusiness and natural resources competencies.
3. To identify and validate a list of competencies (skills and knowledges) required for entrance and advancement in each of the industries in the identified occupational clusters.

Task Analysis Methodology

The methods for the competencies needed portion of the project (Part Two) were based on the curriculum development model used by the Capital Area Career Center.[4] The procedure used to accomplish each of the sub-objectives was as described in the following paragraphs.

Identification of Major Occupational Clusters

The coordinator of the competencies needed component of the project (Part Two), the project consultant, and the project director reviewed:

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[4] The Ingham County Intermediate School District. The school and headquarters are designated The Capital Area Career Center. It is located at 2630 West Howell Road, Mason, Michigan 48854.

1. The number employed in the occupational clusters as indicated in Employment in Agricultural and Agribusiness Occupations: Region 5.[5]
2. The need for analyses of job tasks to assist in offering vocational education programs in occupational clusters where there was evidence of employment opportunity. It was recognized that the manpower needs assessment component of the project (Part One) was designed to provide more adequate information regarding employment opportunities in the agricultural fields. However, the time limits on the project precluded waiting for information from Part One before proceeding with Part Two of the project.
3. The need to clarify and establish the content required for entry level employment in the occupations.

Based on these criteria the competencies needed component was limited to the following occupational clusters: (1) Agricultural Production; (2) Environmental (Ornamental) Horticulture; (3) Farm Implement Repair; and (4) the Biological-Technical Services in Agriculture.

Identification of Job Titles Within the Selected Clusters

Employment Table Section I of Employment in Agricultural and Agri-Business Occupations: Region 5,[6] the handbook prepared by the Economic Research Service from the 1970 Census of Population data, listed 18 categories of occupations "that require or utilize agribusiness competencies in any industry where hired". The 18 categories--which fell within any one of 201 industries--included farmers, farm managers, farm foremen, farm laborers (paid and unpaid), gardeners and groundskeepers (excluding farm), farm implement repairmen, agriculture and biological technicians (except health), and several others. Within each occupation was a list of its component job titles. Those job titles that appeared to be most appropriate for inclusion into the four occupation/industry clusters (identified in the previous section and below) were selected for the task analysis survey.

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[5] USDA, ERS, Employment in Agricultural and Agribusiness Occupations: Region 5.

[6] Ibid.

After a number of conferences with the project director, the project consultant, selected members of the advisory committee, and others, the coordinator prepared comprehensive inventories or lists of skills and knowledges for each of the four selected occupational clusters.

Responses were solicited from workers representing various job titles within Agricultural Production, Environmental Horticulture, Farm Implement Repair, and the Biological-Technical Services in Agriculture. This procedure helped to identify the skills and knowledges required in one or more of the occupations within each cluster.

Identification and Validation of Needed Competencies (Job Task Analysis)

Preparation of Skill and Knowledge Inventories.--As a first step in the development of a comprehensive inventory the coordinator prepared a tentative list of skills and knowledges for each of the occupational clusters. The coordinator reviewed current literature and reports that indicated the nature and requirements of the agricultural occupations, conferred with individuals and small groups in regard to the occupations, and drew upon his experiences and observations in agriculture and vocational education.

The coordinator then analyzed the occupations within the cluster and listed the skills that were performed. He studied each skill to determine if, in his opinion, one or more knowledges were needed by the worker for proper performance of the skill. The knowledges that the coordinator associated with each skill were then incorporated into the inventories. The coordinator's association of specific skills and knowledges may be determined by a review of the Tabular Supplement, Table Series C (S-13 through S-16). The skill and knowledge items are identified by code number. The specific items can be derived from Tables Series B (S-5 through S-12).

The second step involved submitting the inventories to three or more professors at Michigan State University who were specialists in their respective fields. For Agricultural Production, one or more specialists from agronomy, farm management, agricultural mechanics, animal husbandry, dairy husbandry, poultry husbandry, and horticulture reviewed the inventories and suggested modifications. The coordinator modified each inventory to incorporate suggestions made by the specialists.

The third step in the preparation of the inventories involved submitting them to at least three persons in the respective occupational clusters, who were recognized as successful operators, and who were in a supervisory position relative to the level of employment of beginning workers. The inventories for Agricultural Production, Environmental Horticulture, and Farm Implement Repair were submitted through members of the advisory committee representing the respective occupational clusters. These individuals distributed copies to persons in their cluster, collected them and returned them to the director of the project.

The inventory for the Biological-Technical Services in Agriculture was submitted to three technicans at Michigan State University, who were engaged in supervising employees in one or more occupations in the Biological-Technical Services in Agriculture.[7] Conferences were held with these individuals as well as with a number of others involved in the same, or closely related, fields and their suggestions were incorporated. In each case individuals were selected whose experience would qualify them to review and modify the inventories so they would cover the occupations open to beginning workers.

The fourth step in preparation of the inventories involved revision on the basis of these new suggestions.[8] The validation procedure described in the following section tended to eliminate unnecessary skills or knowledges that may have been included.

Validation of Skill and Knowledge Inventories.--Validation of the inventories was accomplished by submitting copies to workers in the respective occupations and asking them to indicate: (1) if the item represented an entry level skill or knowledge; and (2) the relative importance of each item for beginning workers. Sample pages from each of the four task analysis survey instruments were included in Appendix E. Complete lists of the skills and knowledge items were included in Table Series B (S-5 through S-13). Task inventories (critical incident lists) were distributed to workers by local teachers of vocational agriculture, who were employed for this purpose, and/or by individuals suggested by advisory committee members.

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[7] Professor Emeritus Graydon L. Blank, Extension Specialist in Animal Husbandry at Michigan State University assisted and completed most of the work in the preparation and validation of the inventories of skills and knowledges for the Biological-Technical Services in Agriculture.

[8] In some cases suggestions for modification involved behaviors rather than specific skills or knowledges. These were not included in the revised inventories.

Prior to distributing the critical incident lists to workers, the project director met with the teachers to describe the program and to suggest methods of presenting the lists to assure accurate and complete responses. The teachers were selected on the basis of proximity to the area of the state where employment in the occupational cluster was concentrated. In the case of Agricultural Production, consideration was given to the type of farming so that workers (operators and laborers) in the major types would be contacted. In addition, each worker was asked to indicate the type(s) of farming in which he was engaged and to respond to each of the skill and knowledge items in terms of the specific type(s) of farming in which he had worked.[9]

The individuals suggested by the advisory committee members were contacted by mail and asked to submit the lists of skills and knowledges to their employees (preferably the younger ones) for completion or, in case they had none, to fill it out themselves and return the responses to the project director's office. Instructions to these individuals were sent by mail, and in some cases, instructions were supplemented by telephone.

Except for Farm Implement Repair, respondents were asked to indicate the specific industries in which they were involved. In the case of the Environmental Horticulture cluster, occupations (industries such as arboriculture and bedding plants) were identified by the representative who served on the advisory committee. The occupations (industries) for the Agricultural Production cluster were suggested by a review of reports from the Department of Agricultural Economics, Michigan State University, that dealt with types of farms in Michigan. The industries within each cluster are shown on pages 70-71.

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[9] See Appendix E for the type of farming checklist in the farming survey instrument.

Occupations in the Biological-Technical Services in Agriculture cluster were suggested by a review of Employment in Agricultural and Agribusiness Occupations: Region 5[10] and by conferences with experts who reviewed the task inventories.

Terminology

A review of literature regarding task analysis, occupational training, and other concepts related to the development of competency-based curricula in vocational education revealed much variation in the understanding of key terms. To help avoid this problem the following definitions were used in the task analysis component of this report (also see Glossary):

Occupation: "The principle business of one's life; an activity in which one engages."[11]

Industry: "A department or branch of a craft, art, business, or manufacture."[12]

Task: "An assigned piece of work often to be finished within a certain time."[13]

Competency: A brief statement describing a measurable knowledge or skill which an employee within a specific job title would be expected to perform at a predetermined level of proficiency.

Using the above definitions as a base, the researchers considered an occupational cluster to be a group of closely related occupations. An industry indicated a business such as dairy farming, arborist services (arboriculture), landscaping, farm implement repair, and waste disposal biological-technical services.

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[10] USDA, ERS, Employment in Agricultural and Agribusiness Occupations: Region 5.

[11] Webster's New Collegiate Dictionary, 1974.

[12] Ibid.

[13] Ibid.

An occupation referred to that portion of the industry to which a worker was assigned. It may have incorporated the total scope of the individual industry (with the possible exception of top level management). For example, workers in the dairy farming industry performed tasks in practically all of the dairy farm operations.

Task involved "An assigned piece of work . . . ." which contributed to the accomplishment of industry functions and to the success of the worker in his/her occupation. For this study, task involved a physical performance. Competency, in contrast, was used in reference to the worker's ability to perform the task. Although often used interchangeably with task in this report, the term competency was oriented more to the worker than to the job.

Representatives of the horticulture industry suggested the term Environmental Horticulture instead of Ornamental Horticulture as being more descriptive of the cluster of industries and/or occupations that were included in the task analysis component of the project. Arboriculture was not commonly considered by the trade as an industry or occupation within the Ornamental Horticulture cluster, but was considered part of the Environmental Horticulture cluster. The experts who assisted in the preparation of the task inventories had recommended skill and knowledge items that incorporated the broader concept.

The inventories of skills and knowledges were organized into programs according to the nature of the task; e.g., competencies in soils, farm management, and farm power and machinery made up three separate programs on the critical incident list for Agricultural Production (farming). Each of the programs were made to cover, as nearly as possible, those competencies needed for entry level employment at the time of high school graduation. Respondents were asked to check each item in terms of the kinds of programs in which they had experience. For example, a respondent working on a fruit farm would respond to a skill and/or knowledge dealing with the selection or application of fertilizer to fruit trees whereas one working on a grain or bean farm would respond in terms of his experience with those crops.

The occupational clusters and their component industries that were included in the analyses of job tasks are as listed:

Cluster	Component Industries Surveyed
Agricultural Production	Dairy Farming Bush and/or Vine Fruit Farming Tree Fruit Farming Grain and/or Bean Farming Livestock (Beef, Swine, Sheep) Farming Poultry Farming Vegetable, Beet, and/or Potato Farming
Environmental Horticulture	Arboriculture Industry Bedding Plant Industry Garden Center Industry Groundskeeping and/or Park Industry Landscaping Industry Nursery Production Industry Turf and Sprinkler Industry
Farm Implement Repair	Farm Implement Repair

Biological-Technical Services in Agriculture	Agricultural Chemical Biological-Technical Services Animal Laboratory Biological-Technical Services Grain, Feed, and/or Seed Biological-Technical Services Food Processing Biological-Technical Services Waste Disposal Biological-Technical Services Water Resources Biological-Technical Services

Analysis of Data

Usable responses were obtained from 112 workers representing the 21 industries listed in the previous section. Data regarding the job assignments of the respondents were tabulated by hand, while their critical incident list responses were summarized with the computer at the Capital Area Career Center on the same basis as similar data which were collected and used in developing instructional programs and modules for the Center. The summarized data were reported in the Tabular Supplement for each of the previously listed occupational clusters and industries.

Job Assignments of Workers

The respondents were asked to indicate their occupation, years of experience in the occupation, and type of industries in which engaged. Also the interviewers indicated as nearly as possible the kind of job assignment of each worker. These responses were correlated as nearly as possible with occupational titles from the 1970 Census of Population Classified Index of Industries and Occupations and Employment in

Agricultural and Agribusiness Occupations.[14] The job assignment data were summarized in duplicate and reported in both Appendix F (Tables F-1, F-2, F-3, and F-4) and the Tabular Supplement, Table Series A (S-1 through S-4). The number of respondents per cluster were: Agricultural Production, 46; Environmental Horticulture, 26; Farm Implement Repair, 17; and the Biological-Technical Services in Agriculture, 23. The workers in Agricultural Production and Farm Implement Repair--with the respective titles of "farmer" and "farm-equipment mechanic" predominating--had greater homogeneity of job title than did the respondents in the other two clusters.

It was clear from the data reported in the above summaries that the job assignments of workers in the occupational clusters included in this study cut across many of the occupational titles listed in the two 1970 Census of Population-related references cited in the preceding paragraph. It was further noted that many workers were employed in more than one industry within a given cluster. This fact suggested that skills and knowledges needed by agricultural workers cut across industry lines. This was further borne out by the analyses of data submitted by the respondents.

The mean years of experience beyond high school per occupation among the respondents ranged from Agricultural Production with 13.2 years to Environmental Horticulture with 6.2 years. While there was considerable variation in years of experience among respondents, the mean number of years was low enough to lend validity to responses in terms of beginning employment at the time of high school graduation.

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[14] U.S., Department of Commerce, Bureau of the Census, 1970 Census of Population Classified Index of Industries and Occupations and USDA, ERS, Employment in Agricultural and Agribusiness Occupations.

Computer Program for Task Analyses

The computer was programmed to indicate "accept" or "review" for each skill according to the percentage of respondents who indicated the skill was entry level. For this analysis, if 40 percent or more of the respondent answered that the item was an entry level skill, then the skill was marked "accept". A lower percentage resulted in a "review" designation. In all cases where skill items were marked "review", it was later recommended that the items be rejected as unnecessary for inclusion in a high school level program designed to prepare students for employment in the occupation/industry.

The distribution of skills for each of the occupations/industries within an occupational cluster were reported in Table Series B (S-5, S-7, S-9, and S-11). Each of the Series B Tables shows the percentage of respondents who indicated an item was entry level. Similarly, "review" items were identified with an "R" together with the percentage of respondents who did consider the item to be entry level. From the Series B Tables, the reader can recognize items that were common to two or more of the industries within a cluster. It can also be observed that the data differentiated between industries within a cluster where skills peculiar to the industry were concerned, even though some of the respondents had had experience in more than one of the industries in a cluster.

The related knowledges were rated by respondents as "unnecessary", "desirable", or "essential". The computer marked each knowledge item "accept" or "review" based on the percentage of respondents who placed the item in the "essential" column. If 33 percent or more of the respondents rated the item "essential", it was marked "accept".

Table Series B (S-6, S-8, S-10, and S-12) shows the distribution of knowledge items among the occupations/industries of a cluster. The percentage of respondents who reported the item as essential for entry level workers was indicated. "Review" items were designated as "R" together with the percentage of respondents who considered them essential.

Job Skills Needed by Workers

For the purpose of analyzing specific occupations/industries such as dairy farming, landscaping, or waste disposal biological-technical services, a review of the appropriate tables in the Tabular Supplement would be useful. Table Series D (S-17 through S-37) lists accepted job skills with the number and percentage of respondents indicating the skill as entry level and the "total weight" indicated. As stated previously the skill item was "accepted" when 40 percent or more of the respondents considered it an entry level skill. "Total weight" reflected the relative importance of the item based on the proportion of respondents who indicated the item was: "not needed", "minor importance", "some importance", "very important", or "essential".

Table Series E (S-38 through S-58) shows the disposition of job knowledges which were associated with the accepted job skills for each of the industries included in the study. Many of the knowledges which the coordinator and the experts considered as essential were not "accepted" as being essential by workers in the industry.

Relationships of Associated Knowledges to Skills

To analyze the relationship of knowledges to skills within each industry, Table Series F (S-59 through S-79) may be used. The Series F Tables indicate those knowledges considered "essential" by 33 percent or more of the respondents (marked "accept" by the computer), together with the distribution of the associated skills. The reader will note that in many cases where knowledges were marked "accept" the associated skills were also marked "accept". However, for some of the occupations/industries a relatively large number of associated knowledges were marked "review". This was particularly true for some of the occupations in the Biological-Technical Services in Agriculture and Farm Implement Repair clusters.

Rejected Skills and Associated Knowledges

The skills which were "rejected" (marked for review), together with the associated knowledges, were reported as Table Series G (S-80 through S-100). The reader is encouraged to consider the need for these skills and associated knowledges for advancement in the occupation/industry, or advancement to another occupation in the career ladder. It is possible that skills and knowledges listed in the Series G Tables were not required for entry level employment, but may have been essential for advancement.

Discussion of Findings

The competencies needed component of the project included:
(1) identification of major occupational clusters in agriculture;
(2) identification of job titles within the selected clusters; and
(d) identification and validation of competencies needed within the selected clusters. The occupational clusters included in the study were selected by a committee consisting of the project director, the project consultant, and the coordinator of the competencies needed section of the project. In reaching a decision, the group considered available materials, the need for training in terms of numbers employed, and evidence of employment opportunities.

Task analyses were conducted based on the pattern used by the Capital Area Career Center for curriculum development. However, as has been pointed out, the occupational areas for agriculture were not as sharply defined as were those in manufacturing industries and businesses. This was particularly true in the Agricultural Production and Environmental Horticulture clusters. It was advisable therefore to prepare comprehensive inventories of skills and knowledges and to differentiate the importance of each item based on the responses of individual workers in terms of their particular occupation/industry.

The findings for the competencies needed portion of the project are enumerated in the following statements under general findings which deal with items related to all the occupational clusters included in the study. Specific findings which are related to the selected specific occupational clusters are also presented and discussed.

General Findings

1. There was considerable variation in the degree of specialization of workers among the occupational clusters included in the study.
2. A review of the "accepted" skills and knowledges indicated a high degree of discrimination on the part of the respondents.
3. Within an occupational cluster there was evidence of a high degree of commonality of skills and knowledges together with a distinct need for specialization as preparation for work in a specific industry. Examples included Landscaping; Turf and Sprinkler; Grain, Feed, and/or Seed Biological-Technical Services; Animal Laboratory Biological-Technical Services; Agricultural Chemical Biological-Technical Services, and others.

4. For the most part, when respondents indicated an "accepted" skill, they also "accepted" the associated knowledges. However, there were areas in which skills were "accepted" and many associated knowledges were marked for "review".
5. Some skills and knowledges were "rejected" (marked for "review") by workers in specific industries within an occupational cluster. It was clear that some of these were rejected because they did not apply to the specific industry. On the other hand, it was likely that many of the more sophisticated skills and knowledges which were "rejected" were needed for advancement, but were not needed by entry level workers.

Findings Related to Specific Clusters

Agricultural Production.--An examination of Table Series E (S-38 through S-58) indicated that respondents representing the agricultural production industries included in this study needed a wide range of skills and knowledges. In general these dealt with soils, fertilizers, pest control, and maintenance of farm machinery. Skills and knowledges pertaining to a specific type of farming industry tended to be accepted in the specific industry. However, there was considerable overlap of accepted skills and knowledges between farming industries and workers needed skills and knowledges in areas quite unrelated to the major enterprises typical of a specific type of farm.

Environmental Horticulture.--As was true for the Agricultural Production cluster, the respondents for the Environmental Horticulture cluster indicated a need for entry level skills and knowledges that were common to two or more of the industries. Many additional skills and knowledges were "accepted" in some industries and not in others. Respondents discriminated quite sharply between the various Environmental Horticulture industries in terms of skills and knowledges.

Responses for some of the Environmental Horticulture industries--e.g., Bedding Plant and Nursery Production--indicated need for few knowledges (see Table Series F, numbers S-66 through S-72). As noted above, it was felt that respondents provided accurate data for the work they were doing, and that educators need to restudy the real need for knowledges they are teaching and to confine this aspect of the educational program to the relatively few knowledges required by the respective workers. On the other hand, whenever educators are convinced that the knowledge is essential for proper performance of a job skill, the knowledge should be incorporated as part of the instructional module.

Farm Implement Repair.--The respondents for Farm Implement Repair demonstrated a remarkable degree of discrimination in "accepting" certain skills and "rejecting" others for entry level work (see Tables S-9 and S-94). Many of the "rejected" skills were those which are commonly performed by experienced workers as contrasted with beginners. At the same time, these respondents "rejected" many associated knowledges which teachers may find are needed for satisfactory performance of the accepted skills (see Table S-52). As indicated above, educators should give very careful consideration to the need for the "rejected" knowledges. In situations where they are found to be essential for developing satisfactory performance of a skill, they should be included as part of the instructional module.

Biological-Technical Services in Agriculture.--Occupations in the Biological-Technical Services in Agriculture have not been identified and defined in the literature to the same degree as occupations in other occupational clusters. Evidence of this was indicated by the wide range of job assignments and job titles reported by respondents, as shown in Appendix F, Table F-4 (or Table S-4), and by the relatively narrow range of the skills performed in the Biological-Technical Services in Agriculture by many respondents. Even though interviewers were asked to contact biological technicians in agriculture, the data indicated that technician services were provided by individuals who had other duties in addition to Biological-Technical Services in Agriculture. The interviewers found few respondents who had an occupational title of "technican" even though food processing plants, canneries, wineries, veterinary clinics, and related firms were contacted.

CHAPTER IV

SCHOOL PROGRAM CHARACTERISTICS

Objective Question 3: What are the congruencies and discrepancies in existing vocational agribusiness and natural resources programs in terms of: (1) jobs available, programs of instruction available, and career patterns; and (2) competencies needed for job-entrance and competencies being developed in the present programs?

Chapter IV is a report of the program review or school program characteristics component of the project (Part Three).[1] The primary purpose of this component was to respond to Objective Question 3 above by determining, through a review of local programs, the status of reimbursed programs of vocational education in agriculture within the secondary schools of Michigan.

Most, but not all, of the project response to Objective Question 3 was included in this chapter. A portion of the program review component concerning student interests in agriculture is presented in the next chapter. The contents of chapters VI and VII also pertain to Objective Question 3.

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[1] Most of the content of Chapter IV was adapted from data and materials which had been submitted to the project director by Mr. Boyd F. Robinson, Jr., in fulfillment of his responsibility as coordinator of the school program characteristics component of the study. See Boyd F. Robinson, Jr. "School Program Characteristics", Michigan State University, East Lansing, July 1975. (Mimeographed.)

Objectives

The attainment of three sub-objectives was viewed as a necessary precondition for the achievement of the broadly stated primary objective for the program review component. Two of the three sub-objectives were the subject of Chapter IV. They were:

1. To determine the status of current programs of vocational agriculture in Michigan.
2. To determine the availability/accessibility of Michigan vocational agriculture programs on the basis of school size, community type, and geographical location.

Design and Methodology

The design for the review of school program characteristics centered on the collection of a wide array of data related to the status of local programs of vocational agriculture. The areas in which data were collected are as listed:

1. Program Objectives
2. Description of Instruction
3. Facilities and Equipment
4. Student Interests and Aspirations
5. Student Selection Criteria
6. Program Enrollments
7. Occupational Training Patterns
8. Teacher Assignments
9. Occupational Experience Programs
10. Student Follow-up

11. Program Components
12. FFA Chapters
13. School Classification Data
14. Miscellaneous Data

Data for the program review were collected from several different sources. It was necessary to use a number of different samples in order to keep the scope of the study commensurate with available resources. An overview of the design for the review of school program characteristics, shown in Table 30, details the source and nature of the data collected as well as the populations, samples, and the number and percentage of respondents for the study. Sources for the data collected included official records of the Michigan Department of Education, official records of selected local education agencies, local instructors of vocational agriculture, and selected graduates from the Class of 1973.

The methodology of the program review was based on the utilization of one or more instruments for each of the samples listed in Table 30.

The instruments developed for the review of school program characteristics ranged from simple data collection cards to extensive survey schedules. Survey Instrument A consisted of questions designed to obtain data about local programs of vocational agriculture. Information was sought regarding program components, facilities, student selection criteria, teacher assignments, adult instruction, FFA activities, and occupational experience programs. Instrument A was mailed to teachers in all of the 181 schools offering reimbursed instruction in vocational agriculture in Michigan during school year 1973-74.

Table 30.--Overview of Program Review Design.

Source of Data	Nature of Data Collected	Population	Sample	Responses	
				No.	%
All LEAs offering vocational programs of vocational agriculture during school year 1973-74.	Program components Program facilities Teacher assignments Student selection criteria	181 Michigan high schools	Entire population	133	73.5
All schools offering vocational agriculture in a sample of CEPDs during school year 1973-74.	9th and 10th grade curricular data 11th and 12th grade curricular data Program equipment Nature of program objectives	49 Career Education Planning Districts (CEPDs) in Michigan	34 schools in CEPDs	28	82.4
Existing data from Michigan Department of Education records for school year 1973-74.	Student vo. ag. enrollment by program area Occupational experience program data FFA data School classification data Miscellaneous data	181 reimbursed vocational agriculture programs in Michigan	Entire population	181	100.0
Local LEA records for selected students in the Class of 1972-73.	Student occupational training programs	1972-73 vocational agriculture graduates in Michigan	194 Class of 1973 students who took vocational agriculture in six selected schools	194	100.0
Follow-up of 1972-73 vocational agriculture graduates.	Career patterns of graduates	1972-73 vocational agriculture graduates in Michigan	89 graduates who took one-half or more of the vo. ag. offered in six selected schools	24	27.0

SOURCE: Primary data, Robinson.

Survey Instrument B was designed to obtain in-depth data about the nature of program objectives, the nature of content included in the curricula, and the kind of equipment used in the various programs of vocational agriculture at grades nine through twelve. The instrument was segmented in that one section dealt with ninth and tenth grade instruction programs in agriculture while another dealt with eleventh and twelfth grade instruction. While the ninth and tenth grade segment was designed for use with any program at that level, the eleventh and twelfth grade portion was specialized. That is, the eleventh and twelfth grade segment was designed so that separate questions or "mini-instruments" were developed for each of four areas: agricultural production, agricultural mechanics, ornamental horticulture, and agricultural resources and forestry. This breakdown allowed for the survey instrument to be "individualized", since only those "mini-instruments" appropriate for specific vocational agriculture programs were mailed to the teacher. For example, a teacher whose program consisted of tenth and eleventh grade reimbursed programs in agricultural production and ornamental horticulture received an instrument containing the "mini-instruments" for those two areas plus the generalized segment for any ninth and tenth grade instruction offered.

The sample for Instrument B was obtained by randomly selecting nine Career Education Planning Districts (CEPDs) and included for survey purposes all of the schools offering reimbursed programs of vocational agriculture within each CEPD. There was a total of thirty-four such schools in the nine CEPDs. This sampling procedure was used in order to cluster schools for ease of data collection (in cases where it was necessary to visit schools) and to allow for comparison on a CEPD basis.

Instrument C, a form printed on a 5" x 8" card, was used to collect existing data on local vocational agriculture programs from the official records of the Michigan Department of Education. Information collected on this card included data on enrollments in vocational agriculture, occupational experience programs, the FFA, school classification, and miscellaneous items. Data were recorded for each of the 181 schools which offered reimbursed programs of vocational agriculture in Michigan during 1973-74.

Instrument D, also printed on a 5" x 8" card, was used to record data about student occupational training patterns. The permanent school records for 194 students from the Class of 1973 in six selected schools, who completed at least one semester of vocational agriculture, were examined to determine what type of instruction was taken by each of the students during each of the eight semesters of their high school (9-12) experience.

Instrument D was further utilized to record for follow-up purposes the names and addresses of students from the Class of 1973 in the six selected schools who had completed one-half or more of the vocational agriculture offered by their schools. Instrument E was a follow-up instrument designed primarily to obtain data regarding additional training the graduate might have received, the employment status of the graduate, and the nature of the graduate's employment since graduation. The follow-up instrument was mailed to 89 graduates.

All of the instruments used in the review of school program characteristics can be found in Appendix G. Examination of those instruments will shed additional light on the design and methodology of the program review for interested readers.

The Design for the Analysis of Data

Although the design of the study with its numerous instruments and samples was rather complex, the basis for the analysis was straight-forward and centered on the two specific objectives of the program review. Essentially, the design for the analysis of data involved summary statistics for the variables of the study as well as tabular comparisons between a portion of those variables.

Summary statistics for the major variables concerning the first objective, namely that of determining the status of current (school year 1973-74) programs of vocational agriculture in Michigan, are presented in the findings. Those data are found under the section entitled "Nature of Programs of Vocational Agriculture in Michigan" and include demographic variables on local schools, vocational agriculture program characteristics, the nature of teacher assignments, the nature and objectives of the vocational agriculture curriculum, student occupational training patterns, and the nature of career patterns of graduates.

Four independent variables were included in the review of school program characteristics. Data were collected primarily from existing records to classify local schools on the basis of school size, community type, geographical location, and program type. Further information about the nature of these variables can be found in the findings.

In order to achieve the second specific objective of the study which related to the availability/accessability of programs of vocational agriculture, the independent variables were used in a contingency table analysis with numerous dependent variables concerning the nature of local programs of vocational agriculture. The findings of this analysis were reported under the section entitled "The Availability and Accessibility of Programs of Vocational Agriculture".

The Nature of Programs of Vocational Agriculture in Michigan

The assessment of the status of vocational agriculture in Michigan focused on the 181 schools which offered reimbursed programs of vocational education in agriculture during the 1973-74 school year. Instruction in agriculture was offered by the above schools in eight USOE program areas (which included agricultural co-op) through local, shared-time, and/or area center facilities.

Although the findings reported in this section were based primarily on data regarding programs of vocational agriculture during the 1973-74 school year, some of the findings have other bases. For example, findings regarding student training were based on data derived from the four-year high school records of a sample of students from the Class of 1973. And, findings concerning graduate career patterns were based on a follow-up of a subsample of the above students from the Class of 1973.

Enrollment in Vocational Agriculutre

First of all, a brief look at overall school enrollment will serve to enlighten later comments on the main topic. The total school enrollment (K-12) for the 181 schools in the study exceeded 525,000 and the total high school enrollment (9-12) for those schools exceeded 150,000. For the 181 schools, the average school enrollment (K-12) approached 3,000 (2,920) during 1973-74 while high schools (9-12) had an average of approximately 880 students. Nearly three-fourths of the schools in the study had less than 3,000 enrollees (K-12) and about 70 percent of the high schools had less than 800 students. It would appear that most of the schools which offered vocational agriculture in Michigan in 1973-74 tended to be relatively small and that about one-fourth of the schools tended to be sufficiently large to have had relatively high mean enrollments in comparison to the "typical" high school in the study.

Total enrollment in all of the program areas of agriculture for the 181 schools exceeded 18,000. However, that total contained substantial duplication where students were enrolled in more than one program area. The total unduplicated (head count) enrollment in vocational agriculture for 1973-74 was 13,125 with an average of 72.5 students per school. Average enrollment collectively for all program areas of vocational agriculture was 101.3 enrollees per school (included duplication). As is readily apparent, a substantial number of students took instruction in more than one program area. The average number of program areas taken per student was approximately 1.4.

The mean number of sections (classes) offered by schools in the study was 4.8. The mean class size (average enrollment per section) was approximately 21. Many of the above statements and those concerning enrollment breakdowns by program area in the following section were based on the data shown in Table 31.

Table 31.--Distribution of Enrollment and Related Data by Reimbursable Program Area for 181 Michigan Schools Offering Instruction in Vocational Agriculture, 1973-74.

USOE Program		Schools Offering Instruction in Each Area		Percentage of All Program Area Offerings by Each Area	Enroll-ment	Mean Enrollment by Program Area	Total Sections by Program Area	Mean Number of Sections per School	Mean Class Size (Average Enrollment by Section)	Enrollment Percentage by Program Area	Approximate Percentage of Teacher Instructional Time Devoted to Each Area
Code	Area	No.	%	%	No.	No.	No.	No.	No.	%	%
01.01	AGRICULTURAL PRODUCTION	148	81.8	36.3	9,918	67.0	464	3.1	21.4	54.08	52.6
01.02	AGRICULTURAL SUPPLIES	18	9.9	4.4	591	32.8	20	1.1	29.6	3.22	2.1
01.03	AGRICULTURAL MECHANICS	78	43.1	19.1	2,106	27.0	133	1.7	15.8	11.48	15.8
01.04	AGRICULTURAL PRODUCTS	12	6.6	2.9	263	21.9	14	1.2	18.8	1.43	0.3
01.05	ORNAMENTAL HORTICULTURE	65	35.9	15.9	2,217	34.1	105	1.6	21.1	12.08	19.5
01.06	AGRICULTURAL RESOURCES	35	19.3	8.6	1,416	40.5	59	1.7	24.0	7.71	5.4
01.07	FORESTRY	16	8.8	3.9	388	24.3	21	1.3	18.5	2.11	1.9
01.007	AGRICULTURAL CO-OP	36	19.9	8.8	1,445	40.1	47	1.3	30.7	7.87	2.5
Total		408	-	99.9	18,344	$\bar{X}$=45.0	863	$\bar{X}$=4.8	$\bar{X}$=21.3	99.96	100.1

SOURCE: Primary data, Robinson.

NOTE: The above data have been adjusted to account for a small number of cases where data were unavailable for a particular variable (e.g., enrollment data were unavailable for four schools).

The Scope of Program Area Offerings

During the 1973-74 school year, instruction was offered in seven program (content) areas and in agricultural co-op.[2] Schools offering vocational agriculture in general tended to offer instruction in more than one program area. There was a total of 408 program offerings in the 181 schools for an average of 2.25 program areas offered per school. A brief summary for each of the eight program areas with regard to distribution and enrollment follows. Additional related data categorized by program area may be found in Table 31.

Agricultural Production.--This program area was offered by 81.8 percent of the 181 schools and accounted for 36 percent of all program area offerings. Enrollments in production agriculture ranged from 1 to 257 per school with a mean enrollment of 67.

Agricultural Supplies.--Schools offering this program area constituted 9.9 percent of the total. Agricultural supplies represented 4.4 percent of all program area offerings. Enrollments ranged from 7 to 200 with a mean of 33.

Agricultural Mechanics.--There were 43.1 percent of the schools with offerings in agricultural mechanics. This area reported 19.1 percent of all program area offerings. Enrollments ranged from 4 to 100. The average enrollment was 27.

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[2] Agricultural co-op is more accurately a method of instruction than a specific content area. Recognition that agricultural co-op is an instructional method has resulted in the Vocational-Technical Education Service of the Michigan Department of Education excluding it as a separate, reimbursable program area. However, because it was a bonafide program area for reimbursement purposes during the period covered by this study, it will be treated as a program area for purposes of this report.

Agricultural Products.--This program area was found in 6.6 percent of the schools. The 12 programs constituted less than 3 percent of all program area offerings. Enrollments in agricultural products ranged from 10 to 45 and accounted for only 2.9 percent of the total enrollment in all program areas. The mean enrollment was approximately 22.

Ornamental Horticulture.--There were 35.9 percent of the schools that offered instruction in this area which accounted for almost 16 percent of total program area offerings. Enrollments ranged from 13 to 125 with a mean of 34.

Agricultural Resources.--Schools offering this program area made up 19.3 percent of the total. The 35 offerings in agricultural resources accounted for almost 9 percent of all program area offerings. Enrollments ranged from 8 to 200. The mean was approximately 40.

Forestry.--This program area was found in 8.8 percent of the schools. Forestry programs represented approximately 4 percent of all program area offerings. The mean enrollment per school was 24 and enrollments ranged from 11 to 52.

Agricultural Co-op.--The "program area" of agricultural co-op was found in almost 20 percent of the 181 schools which offered vocational agriculture in Michigan during 1973-74. Agricultural co-op is one of the three major experiential-based methods of instruction utilized in Michigan programs of vocational agriculture. The other two experiential-based methods of note are on-farm occupational experience programs and off-farm occupational experience programs. Over 80 percent of the schools had on-farm programs available to students while over 70 percent had off-farm programs available. The use of on-farm and off-farm occupational experience programs may have accounted to some degree for the seemingly low inclusion of agricultural co-op in programs of vocational agriculture. Enrollments in agricultural co-op ranged from 1 to 350 with a mean of 40 for the 36 schools which offered the "program area".

The most frequently offered program areas were agricultural production, agricultural mechanics, and ornamental horticulture. These three areas accounted for over 70 percent of the total program area offerings and over 75 percent of the total enrollment for all program areas.

Components of Vocational Agriculture Programs

Results from Survey Instrument A returned by teachers from 133 of the 181 schools in the study provided findings with regard to the various components included in programs of vocational agriculture in Michigan. The program components may be broken into two groups based on the extent to which individual components were included in vocational agriculture programs.

The first group of components were included in local programs in more than 70 percent of the cases. Table 32 indicates that those in the first group were: ninth, tenth, eleventh, and twelfth grade vocational agriculture instruction; on-farm and off-farm occupational experience programs (grades 9-12); FFA chapter; and summer program.

Ninth and tenth grade instruction in vocational agriculture was offered in approximately 90 percent of the cases. For the most part, metro-core schools--which offered instruction almost exclusively through area centers--did not include ninth and tenth grade instruction in their programs. City schools also tended to include ninth grade instruction less frequently than schools in the other community types.[3]

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[3] See Glossary for definitions of underscored terms.

Table 32.--Distribution of Program Components for 133 Responding Schools Offering Instruction in Vocational Agriculture in Michigan, 1973-74.

Program Component	Schools With Component	Schools Without Component	Schools With Component
	No.	No.	%
Career Exploration Classes in Agriculture at the Seventh and/or Eighth Grade Level	12	121	9.0
Ninth Grade Vocational Agriculture Instruction	117	16	88.0
Tenth Grade Vocational Agriculture Instruction	123	10	92.5
Eleventh Grade Vocational Agriculture Instruction	126	7	94.7
Twelfth Grade Vocational Agriculture Instruction	127	6	95.5
Adult Farmer Instruction	22	111	16.5
Young Farmer Instruction	9	124	6.8
On-Farm Occupational Experience Programs (Grades 9-12)	109	24	82.0
Off-Farm Occupational Experience Programs (Grades 9-12)	97	36	72.9
FFA Chapter	120	13	90.2
Summer Program	117	16	88.0

SOURCE: Primary data, Robinson.

Eleventh and twelfth grade instruction was included in local programs in about 95 percent of the schools. In several cases (about 2 percent), those not offering eleventh and twelfth grade instruction at the local school had advanced instruction available to their students through an area center. Even so, several of the responding schools (less than 3 percent) did not have eleventh or twelfth grade instruction available to their students.

Approximately 82 percent of the responding schools had as a component of their program on-farm occupational experience programs for grades nine through twelve. Off-farm occupational experience was included as an instructional program component for all four grades in nearly 73 percent of the schools. And, as was previously noted, approximately 20 percent of the schools in Michigan offered a program in agricultural co-op.

Ninety percent of the respondents to Instrment A reported that FFA chapters were included in their instructional programs. Official records on all schools offering vocational agriculture indicated that 157 of the 181 (86.7 percent) had FFA chapters as instructional components at the time of the survey. Metro-core schools and area centers though tended not to include FFA chapters in their instructional programs.

Summer programs were found as instructional components in 88 percent of the cases. In 117 of 133 cases, respondents reported that summer programs were a part of the on-going vocational agricultural program.

The second grouping of instructional components were included in local vocational agriculture programs on a very limited basis, as shown in Table 32. Those instructional components included career exploration classes in agriculture, adult/farmer instruction, and young farmer instruction and were included in local programs in less than 20 percent of the cases reported.

Career exploration classes in agriculture at the seventh and/or eighth grade level were only included in 9 percent of the responding schools. Since the need for such classes has been heavily emphasized only in the last several years, it may be that the percentage of schools reporting inclusion of the component should be considered an encouraging sign. In other words, the inclusion of this component appeared to be on the increase even though such an increase is undocumented in this study.

Adult instruction in vocational agriculture was found in only about 17 percent of the schools responding. Many other states in the nation have substantially more adult programs than do vocational agriculture programs in Michigan. Young farmer instruction in Michigan also appeared to be very low relative to other states. Only about 7 percent of the respondents reported the inclusion of young farmer instruction in their programs.

Other program components not listed on Instrument A, but reported by a few of the responding teachers, included FFA alumni associations, special needs programs, summer classes, and an implement repair service.

Facilities for Vocational Agriculture Programs

Two sources of data provided information related to the nature of facilities for local vocational agriculture programs. The first source was the teachers of 133 schools responding to Instrument A with regard to local facilities. The second source was a previously completed study by the Vocational-Technical Education Service of the Michigan Department of Education relating to the nature of laboratory space for vocational programs.[4] The data obtained from the first source are presented in Table 33 while the data from the second source are shown in Table 34.

As one would expect, the one facility that was present in all of the schools was a classroom for instructional purposes. Approximately 64 percent of the respondents had classrooms specially devoted to vocational agriculture while the remainder of the respondents utilized classrooms shared with other areas of instruction, as shown in Table 33.

There was a substantial range in the extent to which various facilities were found in the responding schools. Even so, with the exception of the classroom, no facilities listed on the instrument approached 100 percent inclusion in local programs. In addition to the classroom, approximately 58 percent of the respondents reported that their facilities included an office for the instructor and approximately 73 percent reported a classroom storage area. A very small percentage (9 percent) reported the presence of a student conference room other than the instructor's office. Less than 2 percent of the respondents had individual study areas for their students.

The presence of a land laboratory, the second most common vocational agriculture facility, was reported by approximately 75 percent of the responding schools. In addition, 30 percent of the schools indicated the presence of barns and other land laboratory structures. The use of land laboratories was closely related (though not exclusively) to the agricultural

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[4] Bruce A. Grow and Robert J. Paullin, "The Facility Survey Availability Study" (a statewide study by the Vocational Education and Career Development Services [now Vocational-Technical Education Service], Michigan Department of Education, Lansing, 1974).

Table 33.--Distribution of Facilities for 133 Responding Schools Offering Vocational Agriculture Instruction in Michigan, 1973-74.

Facility	Schools With Facility	Schools Without Facility	Schools With Facility
	No.	No.	%
1. Classroom for Agricultural Use Only	85	48	63.9
2. Classroom Shared with Non-Agricultural Instructors	48	85	36.1
3. Office for Instructor of Vocational Agriculture	77	56	57.9
4. Student Conference Room Other Than Office	12	121	9.0
5. Individual Study Area	2	131	1.5
6. Biology-Type Laboratory	32	101	24.1
7. Classroom Storage Area	97	36	72.9
8. Land Laboratory	100	33	75.2
9. Barns and/or Other Land Laboratory Structures	40	93	30.1
10. Farm Shop	63	70	47.4
11. Shop Storage Area	63	70	47.4
12. School Forest	57	76	42.9
13. Greenhouse	29	104	21.8
14. Nursery	22	111	16.5

SOURCE: Primary data, Robinson.

Table 34.--Distribution of Laboratory Space by Program Area for 181 Schools Offering Instruction in Vocational Agriculture in Michigan, 1973-74.

USOE Program		Schools With Program	Schools With Laboratory Space		Mean Square Footage of Laboratory Space[a]
Code	Area	No.	No.	%	No.
01.01	Agricultural Production	148	102	68.9	1,047
01.02	Agricultural Supplies	18	0	0	---
01.03	Agricultural Mechanics	78	31	39.7	2,295
01.04	Agricultural Products	12	0	0	---
01.05	Ornamental Horticulture	65	24	36.9	1,144
01.06	Agricultural Resources	35	8	22.9	1,147
01.07	Forestry	16	2	12.5	1,661
01.007	Agricultural Co-op	36	0	0	---

SOURCE: Compiled by Robinson from Grow and Paullin, "The Facility Survey Availability Study" (a statewide study by the Michigan Department of Education, Lansing, 1974).

[a] Mean of Schools With Laboratory Space rounded to nearest whole number.

production program area. Table 34 indicates that 102 of the 148 schools (68.9 percent) offering agricultural production in Michigan during 1973-74 had laboratory space designated specifically for use in agricultural production instruction. An average of over 1,000 square feet of laboratory space was found in the 102 schools. That laboratory space did not include the land laboratory but could have included the biology-type laboratory reported by approximately 24 percent of the respondents. It should be noted however that the biology-type laboratory could be effectively utilized in a number of the program areas.

Sixty-five of the 181 schools offering programs in vocational agriculture offered instruction in the ornamental horticulture program area. Twenty-four (36.9 percent) of those schools had an average laboratory space of over 1,100 square feet devoted primarily to ornamental horticulture instruction. Table 33 indicates that almost 22 percent of the responding schools had a greenhouse as a part of their facilities. In addition, almost 17 percent of the schools that responded indicated that their facilities included a nursery.

Nearly one-half (47.4 percent) of the schools indicated the presence of a farm shop and a shop storage area. Shop facilities are primarily but not exclusively utilized in the program areas of agricultural production and agricultural mechanics. Table 34 shows that 39.7 percent of the schools offering agricultural mechanics had laboratory (shop) space devoted to agricultural mechanics instruction. Those schools had, on the average, approximately 2,300 square feet of laboratory space. Although not documented, it was assumed that the balance of the schools offering agricultural mechanics used other shop facilities such as those designated for the agricultural production program area or for other vocational classes.

Almost 43 percent of the responding schools indicated that their facilities included a school forest. The two program areas of agricultural resources and forestry normally use a school forest for instructional purposes. During the 1973-74 school year there were 35 schools offering agricultural resources and 16 schools offering forestry. It is interesting to note that 43 percent of the (responding) schools had forests while only about 19 percent of the (total) schools offered programs in agricultural resources and less than 9 percent offered programs in forestry. Part of this apparent discrepancy can be attributed to use of the school forest for purposes other than instruction in agricultural resources and forestry. However, it would appear that a number of schools possess the facilities to expand their programs into the agricultural resources and forestry areas.

It was noted that 22.9 percent of schools offering agricultural resources and 12.5 percent of those offering forestry had laboratory space that averaged in excess of 1,000 square feet, as shown in Table 34.

Additional facilities cited by respondents included a park area, additional classroom and work space, cold frames, and a lath house.

The Nature of Teacher Assignments

One method of investigating the nature of educational programs was to determine how teacher time was utilized. In this study, vocational agriculture teachers were asked to indicate how each class period was used and to what extent they were involved in related educational activities outside the regular school day. Data regarding the distribution of time devoted to various educational activities of the regular school day are presented in Table 35.

Table 35.--Percentage of Regular School Day Devoted to Various Educational Activities by Teachers of Vocational Agriculture, 1973-74.

Nature of Activity	Percentage of Time Devoted to Each Activity
	% (N=144)[a]
Vocational Agriculture Instruction (Total)	68.2
.01 Agricultural Production	35.7
.02 Agricultural Supplies	1.4
.03 Agricultural Mechanics	10.8
.04 Agricultural Products	.2
.05 Ornamental Horticulture	13.3
.06 Agricultural Resources	3.6
.07 Agricultural Forestry	1.3
.007 Agricultural Co-op	1.7
--- Other Agriculture	.2
Related Vocational Agriculture Activities (Total)	18.9
Adult and Young Farmer Instruction	.1
Farm Visitation	3.5
FFA and Related Activities	.3
Planning and/or Conference	12.2
Combination of Above	2.8
Other Vocational Instruction (Total)	4.9
Other Vocational or Related Instruction	2.8
Co-op Instruction	1.4
Career Exploration Instruction	.7
Other Instruction (Total)	5.9
Supervisory Activities (Total)	2.1
Total (All Activities)[b]	100.0

SOURCE: Primary data, Robinson.

NOTE: The class period was used as the unit of analysis rather than minutes or hours.

[a] Based on responses from 144 teachers in 133 schools.

[b] Non-school activities such as lunch, travel time, etc., were omitted from the analysis.

Vocational agriculture teachers in Michigan during school year 1973-74 used over two-thirds (68.2 percent) of the school day for actual instruction in agriculture. As was previously noted, the program areas of agricultural production, agricultural mechanics, and ornamental horticulture accounted for about 71 percent of the program area offerings and about 77 percent of total program area enrollments. In contrast, approximately 88 percent of actual teacher instructional time was used in the three program areas (see Table 31).

It can be observed in Table 31 that the enrollment percentage (54 percent) and percentage of instructional time (53 percent) devoted to agricultural production were comparable in 1973-74. Therefore, the above discrepancy between relative enrollments and amount of instructional time devoted to each was attributed to the areas of agricultural mechanics and ornamental horticulture. It was subsequently noted that teachers of agriculture in Michigan used approximately 16 percent of their agricultural instruction time in the program area of agricultural mechanics while that program area accounted for less than 12 percent of the program area enrollments. It was also found that teachers used almost 20 percent of their agricultural instruction time for ornamental horticulture instruction while only 12 percent of the enrollments were in ornamental horticulture at the time of survey.

The above findings would appear to indicate that teachers spent substantially more time per pupil in the program areas of agricultural mechanics and ornamental horticulture than in the program area of agricultural production. For other program areas (see Table 31), teachers appear to have had less time per pupil when compared to the agricultural production program area. It should be noted however that the percentage of instructional time in agriculture was based on 144 responding teachers from 133 of the 181 schools that offered vocational agriculture in Michigan during 1973-74. That being the case, the margin for error would be greater in those program areas, such as agricultural products and forestry, which accounted for a small percentage of program area enrollments.

Another point that should be noted is that the percentage of agricultural instruction time did not account for time used for instruction outside of the regular school day such as the instructional time associated with on-farm or off-farm occupational experience programs and instructional time associated with agricultural co-op programs. Time spent in supervision and instruction for agriculture co-op experiences outside the regular school day may account for a portion of the apparent discrepancy between the percentage enrollment in agriculture co-op and the percentage of teacher instructional time devoted to the agricultural co-op program area as shown in Table 31.

Most of the time used in related vocational agriculture activities (almost 19 percent of the regular school day) was spent in planning and/or student conferences, as reported by teachers of agriculture. In fact, over two-thirds of the related activity time was utilized for planning and/or student conferences. The balance of the related activity time during the regular school day was used primarily for farm visitation and combinations of the related activities listed in Table 35. Adult and young farmer instruction and FFA activities accounted for less than one-half of one percent of the teacher's regular school day.

Approximately 87 percent of the regular school day was devoted to the vocational agriculture program while about 13 percent was devoted to activities not related to vocational agriculture. Other vocational instruction--including related instruction, regular co-op instruction, and career exploration instruction--accounted for nearly five percent of the regular school day for teachers of agriculture. Other instruction such as biology, mathematics, and other academic courses accounted for about six percent of the "typical agriculture teacher's" school day while supervisory activities, such as study hall supervision, accounted for an additional two percent of the regular school day.

A number of questions were asked of the teachers relating to the scope of teacher activities that occurred primarily outside of the regular school day. Less than 25 percent of the respondents indicated that adult classes were held, as shown in Table 36.[5] Teachers who conducted adult classes, on the average, held 19 sessions per year and were involved for approximately 50 hours. Only one teacher reported that adult instruction was conducted during the regular school day.

Eighty-five percent (123) of the 144 responding teachers reported they conducted FFA activities outside of the regular school day. The number of FFA activities reported by the 123 teachers averaged approximately 34 per year. And, the number of hours for those activities were reported as averaging nearly 200 hours per annum.

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[5] It is important for the reader to understand the relationship of Table 32 to Table 36. Table 32 dealt with program components such as adult farmer instruction and FFA chapters and was based on a single response from each of 133 schools regardless of the number of vocational agriculture teachers in each school. However, Table 36 was based on the responses of all teachers (144) in the 133 schools regarding the scope of a portion of the program components. Since there was some overlap, the percentages expressed in the two tables may appear to be in conflict. Except for the possibility of errors in reporting, tabulation, or other activities, any apparent conflict can be accounted for by the differences in sample size.

Table 36.--Distribution of Teacher Activities Conducted Primarily Outside of the Regular School Day, 1973-74.

Nature and Scope of the Activity	Respondents Who Reported They Conducted the Activity[a]		Average Number of Times or Hours for the Activity
	No.	(N=144) %	No.
Number of adult class sessions held per year.	34	23.6	18.8 class sessions per year
Approximate number of hours of adult instruction per year.	35	24.3	50.6 hours per year
Approximate number of out-of-school FFA activities per year.	123	85.4	33.6 activities per year
Approximate number of hours of out-of-school FFA activities per year.	120	83.3	192.3 hours per year
Approximate number of hours of supervision for occupational experience programs.	123	85.4	332.8 hours per year

SOURCE: Primary data, Robinson.

NOTE: Based on 144 responding teachers from 133 schools. The relationship of Table 36 to Table 32 is explained in footnote 5 on the preceding page.

[a] A few respondents failed to respond to all questions.

The approximate number of hours devoted to supervision of occupational experience programs, as reported by 85 percent of the 144 respondents, averaged slightly over 330 per year per teacher. However, those hours of supervision did include supervision which occurred during the regular school day. As shown in Table 35, approximately 3.5 percent of the "average teacher's day" was devoted to farm visitation. On the basis of a 36-week year (180 days), supervision during the regular school day probably accounted for less than 50 hours of the more than 300 devoted to occupational experience programs.

The Nature of Student Selection Criteria

Another question of importance to this study concerned the basis on which students are allowed entry into programs of vocational education in agriculture. The most significant finding with regard to this question was that over one-half of the 133 responding schools reported they did not utilize selection criteria for entering students. Apparently those 71 schools have an "open door" policy with regard to entry into vocational agriculture.

The 62 (46.6 percent) respondents who did indicate that student selection criteria were used were asked to indicate what criteria were of importance in the selection process. A check list of numerous criteria was used to determine the nature of the selection process for students entering vocational agriculture at both the ninth and eleventh grade levels. The teachers could check any number of criteria on the check list or add items if they chose. The distribution of the teacher responses is presented in Table 37. It should be noted however that the percentages shown in Table 37 reflect only the responses from teachers who used student selection criteria.

Table 37.--Distribution of Responses by 62 Respondents Who Reported Using Specific Criteria for the Selection of Students Entering Ninth and Eleventh Grade Vocational Agriculture Classes.

Selection Criteria	Percentage of Respondents Using Selection Criteria	
	at Ninth Grade	at Eleventh Grade
	%	%
Demonstrated Interest in Agriculture	72.6	69.4
Demonstrated Aptitude for Agricultural Occupations	17.7	30.6
Recommendations of School Counselor	56.5	48.4
Recommendations of School Administrator	12.9	16.1
Resides on a Family Farm	29.0	29.0
Has Access to Facilities for an On-Farm Occupational Experience Program	27.4	33.9
Results of Personal Interview	37.1	45.2
Approval of Parents	37.1	32.3
Evidence of Financial Need	0.0	3.2
Evidence of Being Socially Disadvantaged	4.8	8.1
Evidence of Being Handicapped	4.8	8.1
Satisfactory School Attendance Record	3.2	9.7
Satisfactory Record of Scholarship	1.6	4.8
Results of Ohio Vocational Interest Survey or Michigan Occupational Preference Survey in Agriculture	3.2	9.7
Completed Instruction at Ninth and/or Tenth Grade Level	NA	51.6
Recommendations of Previous Teachers	4.8	14.5
Other Criteria Identified by Teachers in Completing Survey	11.3	8.1

SOURCE: Primary data, Robinson.

NOTE: Of all responding schools, 46.6 percent (62 of 133) indicated that specific selection criteria were used.

The criterion most frequently used for entry at both the ninth and eleventh grade was a demonstrated interest in agriculture. This criterion was reported to be in use at both grade levels by about 70 percent of the respondents. The second most commonly selected criterion was the recommendation of the school counselor. This was reported to be in use at the ninth grade level by nearly 57 percent of the schools and at the eleventh grade level by about 48 percent.

Over 50 percent of the respondents also indicated that completion of instruction in vocational agriculture at the ninth or tenth grade level was necessary for entry into advanced instruction at the eleventh grade level. Results of personal interviews and approval of parents were used by the respondents at the ninth grade entry point in about 37 percent of the cases. At the eleventh grade entry point, the results of personal interviews were used more extensively (45.2 percent of the cases) while approval of parents was mentioned less frequently (32.3 percent of the cases). Two other criteria cited at both entry points in more than 25 percent of the cases included residing on a family farm and access to facilities for an on-farm occupational experience program.

An overall average increase of approximately five percent was noted in use of the listed criteria at the eleventh grade entry point over the use at the ninth grade entry point. Apparently the tendency to use selection criteria at the eleventh grade level was greater than at the ninth grade level. For example, demonstrated aptitudes for agricultural occupations was cited by respondents for use at the ninth grade level in approximately 18 percent of the cases but was cited at the eleventh grade level in approximately 31 percent of the cases, as shown in Table 37.

Approximately one-half of the items listed in Table 37 were cited less than 20 percent of the time. In addition to the listed criteria a few teachers added items such as being a dropout from other classes, recommendations of current students, and a number of variations of the listed criteria.

The Nature of Basic Instruction in Vocational Agriculture

Findings related to basic instruction in vocational agriculture at the ninth and tenth grade level were based on 28 responses from the sample of 34 schools in nine CEPDs (Career Education Planning Districts). The findings center on the general nature of the objectives and content of basis instruction for vocational agriculture programs in Michigan.

Objectives of Basic Instruction.--One concern relating to basic instruction was the extent to which teachers perceived ninth and tenth grade instruction in vocational agriculture as providing basic skills for advanced instruction. The teachers were asked to respond to questions relating to the above concern for each of the five major content areas of instruction listed in Table 38. Respondents who did not include a particular content area in their program or those who did not respond to the questions for a particular content area were excluded from the analysis, as shown in Table 38.

The teachers who responded to the basic instruction questions were unanimous in their opinion that ninth and tenth grade instruction in the content areas of animal science and plant science provides basic skills for advanced instruction at the secondary level. Nearly 90 percent of the responding teachers expressed positive responses with regard to the content areas of soil science and personal development. However, farm mechanics received a somewhat lower endorsement with approximately 73 percent of the teachers responding positively to the content area questions.

An average of the collective responses over the five content areas (see Table 38) shows that approximately 92 percent of the teachers responding to the questions were of the opinion that ninth and tenth grade instruction provided basic skills for advanced instruction in agriculture at the secondary level. It should be noted, however, that approximately one-third of the survey respondents did not respond to the particular survey items relating to the questions under consideration.[6]

In order to investigate the general nature of the objectives of ninth and tenth grade instruction in vocational agriculture, teachers were asked to indicate which of the components found in Table 39 were included in the instructional objectives for each of four major areas of instruction. The fifth major area of instruction (personal development) considered in this study will be treated separately. The components of interest included career awareness and career exploration as well as the development of knowledges, pre-vocational skills, and vocational skills.

Average inclusion rates or percentages for each of five instructional objective components were calculated across the four content areas of animal science, plant science, soil science, and farm mechanics, as shown in Table 39. The component with the highest average percentage of inclusion within the instructional objectives was reported by respondents to be the development of specific knowledges (83.5 percent). Apparently, the teachers felt that the first priority for ninth and tenth grade instruction was the student's acquisition of knowledges related to occupational

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[6] In the opinion of the survey coordinator, the omissions were due in part to the physical layout of the survey instrument. It would appear that the placement of the questions of concern may have caused a number of respondents to overlook those particular questions.

Table 38.--Distribution of Extent to Which Teachers Perceived Ninth and Tenth Grade Instruction in Vocational Agriculture as Providing Basic Skills for Advanced Instruction.

Major Content Area of Instruction	Schools Offering Instruction by Content Area	Schools Not Responding to Specific Question		Schools Responding to Specific Question	Schools Providing Basic Skills for Advanced Instruction	
	No.	No.	%	No.	No.	%
Animal Science	25	8	32.0	17	17	100.0
Plant Science	24	9	37.5	15	15	100.0
Soil Science	18	9	50.0	9	8	88.9
Farm Mechanics	12	1	8.3	11	8	72.7
Personal Development	12	3	25.0	9	8	88.9
Average for All Areas	--	--	33.0	--	--	91.8

SOURCE: Primary data, Robinson.

Table 39.--Percentages of Schools Including Various Instructional Objective Components for Ninth and Tenth Grade Instruction in Vocational Agriculture, 1973-74.

Major Area of Instruction	N	Percentages of Schools Including Component in Instructional Objectives				
		Awareness of Career Opportunities	Exploration of Occupations	Development of Specific Knowledges	Development of Pre-Vocational Skills	Development of Vocational Skills
		%	%	%	%	%
Animal Science	25	80.0	64.0	88.0	64.0	80.0
Plant Science	24	83.3	70.8	83.3	66.7	91.7
Soil Science	18	61.1	50.0	83.3	72.2	66.7
Farm Mechanics	12	75.0	58.3	75.0	66.7	75.0
Average for Four Areas	--	75.9	62.0	83.5	67.1	79.7

SOURCE: Primary data, Robinson.

skills in agriculture. Even so, approximately 80 percent (an average for the four areas) indicated that the actual development of vocational skills was included in their ninth and tenth grade instructional objectives. The average inclusion rates for the other components--awareness of career opportunities, exploration of occupations, and development of pre-vocational skills--were approximately 76, 62, and 67 percent, respectively.

With regard to the individual areas of instruction, the highest inclusion rate was in the animal science area where 88 percent of the respondents included the development of specific knowledges in their instructional objectives for animal science. The lowest inclusion rate was in the soil science area where 50 percent of the respondents included the exploration of occupations related to soil science in their instructional objectives for that area.

It would appear that all of the components listed in Table 39 are included in a majority of the instructional objectives at the ninth and tenth grade level in the Michigan secondary schools offering vocational agriculture. It further appears that the two most important components at the ninth and tenth grade level, at least in the eyes of vocational agriculture teachers, are the development of specific knowledges and the development of vocational skills.

Personal development, the fifth major area of basic instruction, was reported by approximately 43 percent (12 of 28) of the respondents as being included in their ninth and tenth grade instruction. In order to determine the nature of the instructional objectives for personal development, the respondents were asked to respond to the four specific components discussed and described below.

Approximately 92 percent (11 of 12) of the respondents indicated that their instructional objectives for personal development included students learning to cooperate for the common good in agricultural and civic activities. The other three components included in the instructional objectives for personal development (and the proportion of the 12 respondents who reported their inclusion) were: students associating with and becoming a functioning member of an organization (three-quarters); students developing and maintaining desirable relationships between urban and rural groups (two-thirds); and students participating in the development of local and state policies and programs affecting agriculture (two-thirds).

Content of Basic Instruction.--The description of the instructional content at the ninth and tenth grade level is an important concern. Therefore, the teachers in the CEPD sample were provided with a checklist of instructional units to indicate what content was included in the four major areas of animal science, plant science, soil science, and farm mechanics. A summary of the teacher responses is presented in Table 40.

Approximately 90 percent (25 of 28) of the respondents indicated they included animal science in their basic instruction at the ninth and tenth grade level. The sub-areas of instruction in animal science cited most frequently by the respondents were beef production (92 percent), dairy production (88 percent), and swine production (80 percent). Broiler production, sheep production, horse management, and wildlife management were reported as being a part of basic instruction in from 64 to 40 percent of the cases. Small animals and other sub-areas noted by the teachers--including beekeeping, animal nutrition, and animal breeding--were mentioned by the respondents in 20 percent of the cases.

Table 40.--Percentage of Schools Which Offered Selected Major Areas and Sub-Areas of Instruction in Vocational Agriculture at the Ninth and Tenth Grade Level by Content Area, 1973-74.

Major Area of Instruction	Sub-Area of Instruction	Schools Offering Instruction in Area or Sub-Area No. (N=28)	%
Animal Science		25	89.3
	Swine Production	20	80.0
	Beef Production	23	92.0
	Dairy Production	22	88.0
	Broiler Production	11	44.0
	Sheep Production	15	60.0
	Horse Management	16	64.0
	Small Animals	5	20.0
	Wildlife Management	10	40.0
	Other Sub-Areas	5	20.0
Plant Science		24	85.7
	Plant Identification	22	91.7
	Plant Propagation	22	91.7
	Field Crop Production	20	83.3
	Pest and Weed Control	24	100.0
	Fruit Production	7	29.2
	Home Garden Production	16	66.7
	Ornamental Production	13	54.2
	Other Sub-Areas	4	16.7
Soil Science		18	64.3
	Soil Characteristics	18	100.0
	Plant Food Utilization	18	100.0
	Soil-Land Evaluation	15	83.3
	Soil-Water Management	15	83.3
	Other Sub-Areas	4	22.2
Farm Mechanics		12	42.9
	Basic Woodworking	3	25.0
	Basic Metalworking	6	50.0
	Basic Welding	8	66.7
	Small Engines	8	66.7
	Farm Electricity	7	58.3
	Other Sub-Areas	9	75.0

SOURCE: Primary data, Robinson.

Plant science was found in about 86 percent of the sample schools (24 of 28) that offered basic instruction in vocational agriculture. The sub-areas of plant science most frequently reported by the respondents were pest and weed control (100 percent), plant identification (92 percent), plant propagation (92 percent), and field crop production (83 percent). Home garden production was cited by about two-thirds of the respondents while ornamental production was mentioned less frequently (54 percent) by the respondents. Fruit production, the least cited sub-area, was mentioned by less than 20 percent of the respondents. Other sub-areas reported by four of the respondents included landscaping, horticulture, home beautification, and silviculture (forestry).

In the soil science instructional area, the two sub-areas of soil characteristics and plant food utilization were cited by all respondents while the two sub-areas of soil-land evaluation and soil-water management were mentioned by all but one of the respondents. Other sub-areas noted by a few of the respondents included soil drainage problems and soil conservation. Overall, soil science was included in 18 of the 25 (64 percent) responding schools.

Farm mechanics was the least cited instructional area with only 12 of the 25 (43 percent) respondents indicating it was included in ninth and tenth grade instruction in vocational agriculture. Of the schools offering instruction in farm mechanics, approximately two-thirds offered basic welding and small engines while 7 of the 12 (58.3 percent) offered farm electricity. One-half of those schools offered basic metalworking while only one-fourth (3 schools) offered basic woodworking. Although the inclusion in basic instruction of farm mechanics and its constituent sub-areas was relatively low, it should be noted that 9 of the 12 schools offering farm mechanics included sub-areas other than those listed. The additional sub-areas included farm shop planning and maintenance, farm safety, farm surveying, and farm machinery assembly, operation, and maintenance.

The Nature of Advanced Instruction in Vocational Agriculture

The nature of advanced instruction in vocational agriculture at the eleventh and twelfth grade level was a major aspect of the study. In surveying the teachers of agriculture in the 28 sample schools, questions concerning advanced instruction were asked about each of four program areas of concern. Three of the areas surveyed were the USOE program areas of agricultural production, agricultural mechanics, and ornamental horticulture. A fourth area of concern was agricultural resources and forestry, a combination of the two USOE program areas. The two were combined into a single program area, for purposes of the study, because of the small number of schools offering those programs and the close content relationships between the two areas. The two USOE program areas of agricultural products and agricultural supplies were excluded from the survey because too few schools offered them.

The general questions of interest for each of the four program areas fell into the following categories: (1) the sub-areas of instruction offered; (2) the specific job titles for which students are prepared; (3) the desired student outcomes for the instructional program; and (4) the items of equipment available. In presenting the findings, each of the four categories are discussed by program area in the next section.[7] A fifth category of concern is summarized in the intervening paragraph below.

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[7] Some of the respondents indicated various program areas were offered at their schools but failed to respond to all questions on the survey instrument which concerned those program offerings.

The additional question dealt with whether or not the eleventh and twelfth grade level of instruction provided students with skills necessary for entry into post-secondary instructional programs. Respondents generally indicated that instructional programs were designed to provide vocational skills for occupations which may require additional post-secondary instruction for the students to reach entry level, as shown in Table 41. An average of the responses across all program areas and sub-areas indicates that 83 percent of the respondents gave positive responses to the above question. The highest positive response rate to the question was in the ornamental horticulture program area (94 percent), while the lowest rate was in the agricultural mechanics program area (70 percent).

Advanced Instruction in Agricultural Production.--The program area of agricultural production was offered by 23 of the 28 schools (82 percent) from the sample. This rate closely approximated the distribution of schools offering that program area in the total population of 181 schools as shown in Table 42. Included in the survey were the four agricultural production instructional sub-areas of animal science, plant science, farm business management, and farm mechanics. The data in Table 42 also indicate the percentages of responding schools that offered the four sub-areas. Farm business management was the most commonly reported sub-area, being offered by 65 percent of the schools. Animal science and farm mechanics were offered by 48 percent of the schools. Plant science, the least offered sub-area of instruction, was offered by only 26 percent of the responding schools.

As an average across the four agricultural production sub-areas, approximately 84 percent of the respondents offering instruction in the sub-areas indicated that their instructional program was designed to

Table 41--Distribution of the Extent to Which Teachers Perceived Instruction in High School Vocational Agriculture in Michigan as Providing Students with Vocational Skills for Occupations That May Require Additional Post-Secondary Instruction to Reach Entry Level, by Program Area and Sub-Area.

Program Area or Sub-Area	Schools in Sample Offering Instruction in Program Area or Sub-Area	Respondents Indicating That Instruction Provides Vocational Skills for Occupations Requiring Additional Post-Secondary Instruction to Reach Entry Level	
	No. (N=28)[a]	No.	%
Agricultural Production	23	---	93[b]
Animal Science	11	9	82
Plant Science	6	6	100
Farm Business Management	15	14	93
Farm Mechanics	11	11	100
Agricultural Mechanics	10	7	70
Ornamental Horticulture	12	---	94[c]
Arboriculture	10	9	90
Floriculture	7	7	100
Landscaping	10	8	80
Greenhouse Operation and Management	7	7	100
Nursery Operation and Management	6	6	100
Turf Management	8	8	100
Agricultural Resources and/or Forestry	5	3	75[d]

SOURCE: Primary data, Robinson.

[a] Responding schools from a sample of 34.

[b] Percentage based on an average of the four sub-areas of agricultural production.

[c] Percentage based on an average of the six sub-areas of ornamental horticulture.

[d] One of five respondents for agricultural resources and/or forestry did not respond to the item. Percentages based on four respondents.

Table 42.--Distribution of the Extent to Which Michigan High School Programs of Vocational Agriculture Included Advanced Instruction and Instruction for Specific Job Titles, by Program Area or Sub-Area, in 1973-74.

Program Area of Sub-Area	Schools in Sample Offering Instruction in Program Area or Sub-Area		Percentage Offering Program Area in the Total Population of Schools	Instruction Leading to Specific Job Title	
	No. (N=28)[a]	%[b]	% (N=181)	No.	%[c]
Agricultural Production	23	82.1	81.8	--	83.7[d]
Animal Science	11	47.8		11	100.0
Plant Science	6	26.1		5	83.3
Farm Business Management	15	65.2		13	86.7
Farm Mechanics	11	47.8		7	63.6
Agricultural Mechanics	10	35.7	43.1	10	100.0
Ornamental Horticulture	12	42.9	35.9	--	87.5[e]
Arboriculture	10	83.3		7	70.0
Floriculture	7	58.3		7	100.0
Landscaping	10	83.3		8	80.0
Greenhouse Operation and Management	7	58.3		7	100.0
Nursery Operation and Management	6	50.0		6	100.0
Turf Management	8	66.7		7	87.5
Agricultural Resources and Forestry	5	17.9	23.8	4	80.0

SOURCE: Primary data, Robinson.

[a] Responding schools from a sample of 34.

[b] Percentage offering sub-area based on number offering instruction in the corresponding program area.

[c] Percentage of instruction leading to specific job title based on number offering instruction in each sub-area.

[d] Average percentage over the four sub-areas of agricultural production.

[e] Average percentage over the six sub-areas of ornamental horticulture.

prepare students to enter and advance in one or more specific job titles. The percentage offering instruction leading to specific job titles for each of the sub-areas may be found in Table 42.

The specific job titles identified by respondents as those for which students were being prepared did not vary significantly across the four agricultural production sub-areas. In other words, those job titles cited by respondents for one sub-area were basically the same job titles as reported for the other sub-areas. As shown in Table 43, those job titles were all concerned with the operation and maintenance of farms. It should be noted that the job titles listed in Table 43 were identified as job titles for which students were being prepared by at least 60 percent of those respondents offering instruction in a given program area or sub-area.

All of the desired student outcomes listed in Tables 44, 45, and 46 for the agricultural production sub-area of animal science, plant science, and farm business management were identified by at least 60 percent of the respective respondents as being a part of their instructional programs.[8] The percentages of respondents citing desired student outcomes averaged 86 percent when all three of the above sub-areas were considered.

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[8] The desired student outcomes included in Survey Instrument B were compiled from various sources by Robinson. Among the sources were the Michigan Department of Education Performance Objectives for Vocational Education; the preliminary drafts of the task analysis survey instruments used in this study (see Appendix E for selected pages); the Curriculum Guides for Career Education in Agribusiness, Natural Resources, and Environmental Protection developed by the Ohio Career Education and Curriculum Management Laboratory in Agricultural Education, The Ohio State University, Columbus, Ohio, 1974; and other references related to course content.

Table 43.--Major Job Titles for Which Students are Prepared at the Eleventh and Twelfth Grade Level in Local Programs of Vocational Agriculture as Identified by Vocational Agriculture Teachers, by Program Area or Sub-Area.

Program Area or Sub-area	Job Title
Agricultural Production[a] (Identified in each of the sub-areas of animal science, plant science, farm business management, and farm mechanics.)	Farm Operator Farm Manager Farm Foreman Farm Laborer Part-time Farmer
Agricultural Mechanics	Ag. Equipment Mechanic Ag. Equipment Mechanic's Helper Farm Equipment Operator Tractor Mechanic
Ornamental Horticulture	
Arboriculture	Arborist Park Worker Tree Service Worker
Floriculture	Flower Shop Employee Flower Grower Greenhouse Employee
Landscaping	Landscape Draftsman Landscape Nurseryman Cemetery or Park Laborer Landscape Salesman Landscape Gardener Landscape Aide Landscape Maintenance or Installation Foreman Landscape Service Laborer
Greenhouse Operation and Management	Greenhouse Employee Plant Propagator Flower Grower Garden Center Employee
Nursery Operation and Management	Nurseryman Nursery Salesman Nursery Worker Nursery Grower
Turf Management	Groundskeeper Golf Course Laborer Greenskeeper
Agricultural Resources and Forestry	Conservation Aide Forest Worker Park Worker Game Farm Worker Animal Caretaker Logger Tree Service Worker Forest Aide

SOURCE: Primary data, Robinson.

NOTE: Job titles listed were identified by at least 60 percent of the teachers who offered instruction in the various program areas or sub-areas, including those teachers not preparing by job title.

[a] Only 45 percent of the teachers offering instruction in the sub-area of farm mechanics identified the job title of "Farm Foreman" as one that students were prepared for in farm mechanics. Through an oversight the job title of "Part-Time Farmer" was omitted from the portion of the survey dealing with the sub-area of plant science.

Table 44.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in the Animal Science Aspect of Agricultural Production Includes Given Desired Student Outcomes.

Code	Desired Student Outcomes	Student Outcome Included	
		No. (N=10)	%
ASOUTC16	Able to determine the competencies & requirements for specific careers in the ANIMAL SCIENCE area.	9	90.0
ASOUTC17	Able to follow proper procedures in locating, applying, and interviewing for a specific job.	8	80.0
ASOUTC18	Able to work cooperatively with others so as to enhance succeeding on the job.	8	80.0
ASOUTC19	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	9	90.0
ASOUTC20	Able to serve effectively as an officer or member of an organization.	9	90.0
ASOUTC21	Able to select quality animals in one or more animal production areas for breeding, feeding, slaughter, etc.	10	100.0
ASOUTC22	Able to evaluate production and pedigree records for selection & breeding.	8	80.0
ASOUTC23	Able to conduct an effective breeding program in one or more animal production areas.	9	90.0
ASOUTC24	Able to develop adequate & economical livestock housing & shelter.	9	90.0
ASOUTC25	Able to compare & evaluate material handling systems.	7	70.0
ASOUTC26	Able to identify & control common farm animal diseases & parasites.	8	80.0
ASOUTC27	Able to perform common skills with livestock & poultry such as castration, debeaking, etc.	9	90.0
ASOUTC28	Able to select adequate & economical feedstuffs for livestock & poultry.	8	80.0
ASOUTC29	Able to solve common digestive & nutrient deficiency problems.	10	100.0
ASOUTC30	Able to balance animal rations that are economical & adequate.	10	100.0
ASOUTC31	Able to market one or more agricultural products efficiently & effectively.	8	80.0

SOURCE: Primary data, Robinson.
NOTE: One of the 11 schools offering animal science did not respond to the student outcome item.

Table 45.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in the Plant Science Aspect of Agricultural Production Includes Given Desired Student Outcomes.

Code	Desired Student Outcomes	Student Outcome Included	
		No. (N=6)	%
PSOUTC45	Able to determine the competencies & requirements for specific careers in the PLANT SCIENCE area.	6	100.0
PSOUTC46	Able to follow proper procedures in locating, applying, and interviewing for a specific job.	6	100.0
PSOUTC47	Able to work cooperatively with others so as to enhance succeeding on the job.	6	100.0
PSOUTC48	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	6	100.0
PSOUTC49	Able to serve effectively as an officer or member of an organization.	6	100.0
PSOUTC50	Able to select & implement appropriate tillage practices for various soil types, soil conditions, & crops.	6	100.0
PSOUTC51	Able to select & utilize proper tillage equipment for various soil types, conditions, & crops.	6	100.0
PSOUTC52	Able to select and safely operate proper planting equipment for various crops under various conditions.	6	100.0
PSOUTC53	Able to properly calibrate planting equipment.	5	83.3
PSOUTC54	Able to select & use appropriate planting procedures for various crops under various conditions.	6	100.0
PSOUTC55	Able to select appropriate fertilizers for various crops & soil conditions.	6	100.0
PSOUTC56	Able to make lime & fertilizer applications effectively.	6	100.0
PSOUTC57	Able to select & safely apply appropriate herbicides to control weeds in various crops.	5	83.3
PSOUTC58	Able to identify weeds & specify control measures.	6	100.0
PSOUTC59	Able to identify & specify control measures for common crop diseases.	5	83.3
PSOUTC60	Able to identify and specify control measures for common insects affecting crops.	5	83.3
PSOUTC61	Able to select & safely apply appropriate pesticides to control common crop insects.	5	83.3
PSOUTC62	Able to select & safely apply chemicals to control common crop diseases.	4	66.7
PSOUTC63	Able to harvest & properly store common farm crops.	6	100.0
PSOUTC64	Able to select & safely operate harvesting equipment for various farm crops.	6	100.0

SOURCE: Primary data, Robinson.

Table 46.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in the Farm Business Management Aspect of Agricultural Production Includes Given Desired Student Outcomes.

Code	Desired Student Outcomes	Student Outcome Included	
		No. (N=15)	%
FBMOUT14	Able to determine the competencies & requirements for specific careers in the FARM BUSINESS MANAGEMENT area.	12	80.0
FBMOUT15	Able to follow proper procedures in locating, applying, & interviewing for a specific job.	11	73.3
FBMOUT16	Able to work cooperatively with others so as to enhance succeeding on the job.	12	80.0
FBMOUT17	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	13	86.7
FBMOUT18	Able to serve effectively as an officer or member of an organization.	12	80.0
FBMOUT19	Able to establish & keep accurate farm records for one or more farming enterprises.	15	100.0
FBMOUT20	Able to utilize farming records for evaluation & planning of one or more farming enterprises.	15	100.0
FBMOUT21	Able to utilize various production forecasts to plan one or more farming enterprises.	15	100.0
FBMOUT22	Able to select marketing outlets for farm products for best returns.	14	93.3
FBMOUT23	Able to select economical sources of farm equipment and supplies.	14	93.3
FBMOUT24	Able to select appropriate equipment & supplies for one or more farming enterprises.	14	93.3
FBMOUT25	Able to determine most efficient use of labor, materials, & equipment.	11	73.3
FBMOUT26	Able to operate on the futures market in one or more commodity area.	8	53.3
FBMOUT27	Able to conduct financial transactions common to a farm business.	14	93.3
FBMOUT28	Able to determine the relative advantages of loan procedures & credit arrangements.	14	93.3
FBMOUT29	Able to identify & select adequate & economical insurance coverage for farming operations.	11	73.3
FBMOUT30	Able to select appropriate types of ownership for farming operations.	13	86.7
FBMOUT31	Able to establish or complete legal transactions involving contracts, land transfers, inheritance, and similar transactions.	10	66.7
FBMOUT32	Able to file tax returns for farming operations.	9	60.0
FBMOUT33	Able to manage farm labor efficiently.	11	73.3

SOURCE: Primary data, Robinson.

Consequently, there was little basis for discrimination between the different types of outcomes for those sub-areas. The outcomes for the three sub-areas relating to leadership abilities and obtaining and holding a job were mentioned at about the same frequency as other, more technically oriented outcomes.

The responses for desired student outcomes for the farm mechanics sub-area differed significantly from the three instructional sub-areas previously discussed. Farm mechanics had the greatest range (from 18 to 100 percent) in desired outcome response rates and the lowest average percentage (approximately 62 percent) of positive responses to desired student outcomes among the four agricultural production sub-areas surveyed. A visual analysis of Table 47 suggests that the emphasis for farm mechanics instruction centered on the operation, repair, and maintenance of farm machinery. Outcomes for farm mechanics instruction relating to leadership abilities and obtaining a job were mentioned at about the same frequency as other outcomes for farm mechanics. However, leadership and job procurement-related outcomes were checked less frequently in the farm mechanics sub-area than in the other three sub-areas.

Responses relating to the items of equipment available for use in the agricultural production program area were obtained from 22 of the 23 schools which offered advanced instruction in that area and are presented in Table 48. For purposes of analysis, the equipment listed in Table 48 can be arranged into three basic categories: (1) specialized equipment for farm mechanics; (2) general equipment for farm mechanics; and (3) equipment for technical agricultural skills in the animal and plant science areas.

Table 47.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in the Farm Mechanics Aspect of Agricultural Production Includes Given Desired Student Outcomes.

Code	Desired Student Outcomes	Student Outcome Included No. (N=11)	Student Outcome Included %
FMOUTC47	Able to determine the competencies & requirements for specific careers in the FARM MECHANICS area.	7	63.6
FMOUTC48	Able to follow proper procedures in locating, applying, & interviewing for a specific job.	7	63.6
FMOUTC49	Able to work cooperatively with others so as to enhance succeeding on the job.	8	72.7
FMOUTC50	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	5	45.5
FMOUTC51	Able to serve effectively as an officer or member of an organization.	5	45.5
FMOUTC52	Able to service & repair four-cycle engines.	7	63.6
FMOUTC53	Able to service & repair two-cycle engines.	7	63.6
FMOUTC54	Able to service & perform preventive maintenance on farm tractors & machinery.	11	100.0
FMOUTC55	Able to repair farm equipment & machinery effectively using an electric arc welder safely.	10	90.9
FMOUTC56	Able to repair farm equipment & machinery effectively using oxy-acetylene welding equipment safely.	10	90.9
FMOUTC57	Able to calculate electrical service requirements for shop, barns, etc. to code specifications.	4	36.4
FMOUTC58	Able to perform preventive maintenance on electrical farm wiring systems & farm.	6	54.5
FMOUTC59	Able to construct farm out-buildings such as pole barns, storage sheds, etc.	5	45.5
FMOUTC60	Able to pour, finish, and cure concrete.	8	72.7
FMOUTC61	Able to maintain & safely utilize power construction tools.	5	45.5
FMOUTC62	Able to install, repair, & maintain farm plumbing systems of steel, plastic, & copper pipe.	2	18.2
FMOUTC63	Able to operate & maintain farm equipment & machinery safely.	8	72.7
FMOUTC64	Able to plan & establish a farm shop.	9	81.8
FMOUTC65	Able to select & maintain electric motors for farm uses.	5	45.5

SOURCE: Primary data, Robinson.

Table 48.--Distribution of the Availability of Selected Items of Equipment for Instructional Use in Production Agriculture in 22 Michigan High Schools, 1973-74.

Equipment Item	Respondents Indicating Equipment Item was Available	
	No. (N=22)^a	%
Planer	4	18
Radial Arm Saw	6	27
Tilting Arbor Saw	4	18
Jointer	7	32
Pipe Cutter	7	32
Pipe Dies & Ratchet	7	32
Masonry Equipment	6	27
Wiring & Electrical Tools	6	27
Drill Press	11	50
Portable Electric Drills	11	50
Bench Grinder	11	50
Power Hack Saw	10	46
Portable Sander	8	36
Grindstones & Wire Wheel Brush	10	46
Band Saw	9	41
Anvil	11	50
Oxyacetylene Welding & Cutting Unit	11	50
Arc Welder with Accessories	11	50
Arc Welding Tables	11	50
Farm Tractor; Assorted Planting, Tillage & Harvesting Equipment	11	50
Sabre Saw	8	36
Paint Spray Outfit	8	36
Air Compressor	10	46
Electric Hoist	1	5
Common Woodworking Hand Tools	9	41
Common Metalworking Hand Tools	11	50
Work Benches	12	55
Tap and Die Set	10	46
Soldering Equipment	9	41
Assorted Screwdrivers and Wrenches	13	59
Socket Wrench Set	13	59
Small Engine Tool Assortment	10	46
Steam Cleaner	5	23
Farm Level or Transit	11	50
Assorted Surveying Equipment	8	36
Dehorners	14	64
Vaccination Syringes	8	36
Livestock Grooming Equipment	14	64
Castration Equipment	18	82
Soil Test Kit	19	86
Soil Auger or Tube	20	91
Pruning Shears & Saws	15	68
Hand and/or Tank Sprayers	11	50
Livestock Scales	5	23
pH Test Kit	15	68
Livestock Clippers	15	68
Sheep Shears	9	41
Calculators or Adding Machine	6	27
Other	9	41

SOURCE: Primary data, Robinson.

NOTE: Respondents were asked to check all equipment listed that was available for use in the agricultural production program area.

[a] One of the 23 responding schools offering agricultural production did not respond to the equipment inventory item.

A visual analysis of the data in Table 48 suggests that less than one-third of the respondents had "first category" equipment items--such as those needed for the specialized areas of advanced farm carpentry and farm electricity, masonry, and plumbing--available for instructional use in the agricultural production program area. Equipment items in the "first category" included planers, radial arm saws, wiring and masonry tools, and pipe cutters and dies.

In general, from one-third to two-thirds of the respondents indicated that general farm mechanics equipment needed for basic farm carpentry and metalworking and farm tractor-machinery-implement operation and maintenance, and elementary farm surveying was available. "Second category" items included portable electric drills, arc and oxyacetylene welding equipment, farm tractors and implements, common metal- and woodworking hand tools, small engine tools, and farm levels or transits.

With regard to the first two categories dealing with farm shop items, it is important to remember that only about one-half of the respondents (11 of 23) actually included farm mechanics as a sub-area of instruction in the agricultural production area. Accordingly, only about half of the respondents should be expected to have farm equipment available for advanced instruction in agricultural production. A more extensive, in-depth analysis would be required to accurately determine the equipment available for farm mechanics instruction in the program area of agricultural production. It should be noted that farm mechanics instruction as a part of agricultural production is not the same as the agricultural mechanics program area which is described in the next section.

"Third category" equipment, or equipment needed for teaching technical agricultural skills in the sub-areas of animal science, plant science, and farm business management, was reported by respondents as available in over two-thirds of the schools offering instruction in agricultural production. Items in the "third category" included dehorners, castration tools, livestock grooming tools, soil testing equipment, and pruning shears and saws.

Advanced Instruction in Agricultural Mechanics.--The program area of agricultural mechanics was found in 10 (36 percent) of the 28 responding sample schools. By contrast, the same program area was offered by 43 percent of the 181 schools in the total population (see Table 42). Although a number of sub-areas such as agricultural electrification, agricultural power and machinery, and others are normally associated with agricultural mechanics, for purposes of this study instruction in agricultural mechanics was considered as a single unit.

As shown in Table 42, all of the ten respondents indicated that instruction in agricultural mechanics was designed to prepare students to enter and advance in one or more specific job titles. Furthermore, agricultural mechanics was the only program area in which all respondents indicated that instruction was designed to prepare for specific job titles.

Job titles for agricultural mechanics (see Table 43) centered on the operation, maintenance, and repair of farm tractors, machinery, and equipment. Only 20 percent or less of the respondents (1 or 2 of the 10) reported that other job titles such as soil conservation aide, rural electrician helper, and farm building contractor were ones for which students were prepared.

An examination of Table 49 shows that the desired student outcomes most frequently mentioned by the respondents were related to the operation, maintenance, and repair of farm tractors, machinery, and equipment. On the average, outcomes related to leadership and obtaining a job were reported by 50 percent of the respondents. Outcomes related to plumbing and masonry and to the sale of farm machinery and supplies were cited less frequently. In general, only about 30 percent of the respondents mentioned the respective plumbing, masonry, or sales related outcomes.

The list of equipment for agricultural mechanics presented in Table 50 is the same as the December 1973 Minimum-Maximum Equipment List used by the Vocational Education and Career Development Services (now Vocational-Technical Education Services) of the Michigan Department of Education and covers only the agricultural power and machinery sub-area of agricultural mechanics.[9] In general, the most frequently cited equipment items were welding equipment, grinders, drill press, tap and die set, and related metalworking items. The least mentioned items appeared to be engine testing and related equipment. Further details are shown in Table 50.

Advanced Instruction in Ornamental Horticulture.--The program area of ornamental horticulture was offered in 12 (43 percent) of the 28 schools in the sample. During the same year, approximately 36 percent of the total population of 181 schools offered programs in ornamental horticulture (see Table 42). Included in the survey were the six instructional sub-areas of arboriculture, floriculture, landscaping, greenhouse operation and management,

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[9] The Minimum-Maximum Lists were prepared by the Michigan Department of Education to serve as administrative guides for school districts in equipping their vocational programs to qualify for reimbursement purposes.

Table 49.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in Agricultural Mechanics Includes Given Desired Student Outcomes.

Code		Student Outcomes Included No.	% (N=10)
AMOUTC17	Able to order parts & supplies.	8	80.0
AMOUTC18	Able to perform sales activites related to the selling of farm machinery and/or parts effectively.	2	20.0
AMOUTC19	Able to recondition agricultural equipment including cleaning, preparation priming, and painting.	9	90.0
AMOUTC20	Able to identify & correctly price machine parts.	3	30.0
AMOUTC21	Able to complete sales invoices.	3	30.0
AMOUTC22	Able to complete inventory card correctly.	2	20.0
AMOUTC23	Able to use parts catalogs, price lists, inventory records.	5	50.0
AMOUTC24	Able to receive, check-in, & store incoming parts.	4	40.0
AMOUTC25	Able to operate & maintain hand & power metalworking tools safely.	7	70.0
AMOUTC26	Able to troubleshoot & correct ignition & electrical problems in internal combustion engines.	7	70.0
AMOUTC27	Able to assemble, adjust, & lubricate agricultural equipment.	9	90.0
AMOUTC28	Able to troubleshoot & repair internal combustion engines.	8	80.0
AMOUTC29	Able to troubleshoot & repair hydraulically operated equipment.	2	20.0
AMOUTC30	Able to troubleshoot & repair the carburetors & fuel systems of gasoline fueled engines.	8	80.0
AMOUTC31	Able to troubleshoot & repair cooling systems for internal combustion engines.	6	60.0
AMOUTC32	Able to check & lubricate internal combustion engines, transmissions, differentials, & wheel bearings of farm tractors & machinery.	9	90.0
AMOUTC33	Able to check, adjust, & repair brake systems of farm tractors & machinery.	9	90.0
AMOUTC34	Able to adjust standard & fluid transmission systems for farm tractors & machinery.	4	40.0
AMOUTC35	Able to maintain & change the tires on farm tractors & machinery.	8	80.0
AMOUTC36	Able to operate farm tractors & other farm power machinery.	9	90.0
AMOUTC37	Able to service & perform preventive maintenance on farm tractors & machinery.	9	90.0
AMOUTC38	Able to operate, adjust, & repair common tillage equipment.	7	70.0
AMOUTC39	Able to operate, adjust, & repair common seeding equipment.	7	70.0
AMOUTC40	Able to operate, adjust, & repair common fertilizer and/or pesticide applicators.	6	60.0
AMOUTC41	Able to operate, adjust, and/or repair common cultivation equipment.	7	70.0
AMOUTC42	Able to operate, adjust, and/or repair common harvesting equipment.	6	60.0
AMOUTC43	Able to troubleshoot & repair 2-cycle & 4-cycle engines.	7	70.0
AMOUTC44	Able to perform advanced brazing, welding, & cutting skills with oxy-acetylene welding equipment.	7	70.0
AMOUTC45	Able to perform advanced welding skills with arc welding equipment.	7	70.0
AMOUTC46	Able to operate & maintain hand & power tools.	6	60.0
AMOUTC47	Able to pour, finish, & cure concrete.	3	30.0
AMOUTC48	Able to cut, thread, & install steel pipe.	1	10.0
AMOUTC49	Able to install & maintain plastic pipe.	2	20.0
AMOUTC50	Able to install & maintain copper pipe.	2	20.0
AMOUTC51	Able to determine the competencies & requirements for specific careers in the AGRICULTURAL MECHANICS area.	4	40.0
AMOUTC52	Able to follow proper procedures in locating, applying, & interviewing for a specific job.	6	60.0
AMOUTC53	Able to work cooperatively with others so as to enhance succeeding on the job.	7	70.0
AMOUTC54	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	4	40.0
AMOUTC55	Able to serve effectively as an officer or member of an organization.	4	40.0

SOURCE: Primary data, Robinson.

Table 50.--Distribution of the Availability of Selected Items of Equipment for Instructional Use in Agricultural Mechanics in Ten Michigan High Schools, 1973-74.

Equipment Item	Respondents Indicating Equipment Item was Available	
	No. (N=10)	%
Oxyacetylene Welding and Cutting Unit	9	90
Gas Welding Bench	9	90
Parts Cleaning Tank	6	60
Live Engine Stand	4	40
Impact Wrench Set	4	40
Micrometer Set	6	60
Alternator/Generator Regulator Tester	6	60
Engine Analyzer	4	40
Hydraulic Jack	7	70
Power Chisel	4	40
Arc Welder and Accessories	9	90
Sander/Grinder, Portable	6	60
Overhead Reel Assemblies	1	10
Steam Cleaner	4	40
Drill Press	8	80
Pedestal Grinder	7	70
Universal Motor Stand	3	30
Master Tool Set with Storage Box	7	70
Welding Bench	9	90
Waste Oil Dispenser	3	30
Mobile Crane--Boom	3	30
Tap and Die Set	8	80
Air Compressor	8	80
Pressure Gauge Set	2	20
Compression Gauge Set	5	50
Tractor Dynamometer	0	0
Battery Charger Tester	6	60
Spray Paint Gun with Accessories	4	40
Work Benches	9	90

SOURCE: Primary data, Robinson.

NOTE: The list of equipment for agricultural mechanics is the December 1973 Minimum-Maximum Equipment List used by the Vocational Education and Career Development Services of the Michigan Department of Education and covers only the power mechanics (agricultural power and machinery) sub-area of agricultural mechanics. Respondents were asked to check all equipment listed that was available for use in the agricultural mechanics program area.

and turf management. All of the sub-areas were offered by at least one-half of the 12 schools with programs in ornamental horticulture. The number of schools offering each sub-area is reported in Table 42.

As an average across the six sub-areas, about 88 percent of the respondents indicated that instruction was designed to prepare students to enter and advance in one or more specific job titles (see Table 42). The arboriculture sub-area drew the lowest positive response rate in that regard with 7 of the 10 respondents giving positive responses.

There was a wide variety of job titles (over 20) for which students were being prepared that were identified by at least 60 percent of the respondents in the various sub-areas of ornamental horticulture. The breadth of the ornamental horticulture program area is evident from a review of Table 43.

The responses to the desired student outcomes for each of the ornamental horticulture sub-areas indicated that a high degree of commonality existed among the outcomes of the six sub-areas. It was found that most of the desired student outcomes that were accepted for a particular sub-area were also accepted for other ornamental horticulture sub-areas. In other words, job titles in the ornamental horticulture area require a number of the same basic skills.

An analysis of the desired student outcomes for the six ornamental horticulture sub-areas, presented in Tables 51 through 56, resulted in several observations. Outcomes related to leadership tended to be included less frequently in ornamental horticulture programs than in other program areas. In general, leadership outcomes were cited by less than 50 percent of the respondents in each area. Outcomes related to obtaining

Table 51.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in the Arboriculture Aspect of Ornamental Horticulture Includes Given Desired Student Outcomes.

		Student Outcomes Included	
Code	Desired Student Outcome	No.	% (N=10)
ARBOUT13	Able to identify the basic soil classes.	8	80.0
ARBOUT14	Able to safely apply chemicals for disease, weed, or insect control.	10	100.0
ARBOUT15	Able to identify the basic parts of plants.	9	90.0
ARBOUT16	Able to operate & maintain small gasoline engines.	4	40.0
ARBOUT17	Able to identify & select shrubs for a variety of uses.	10	100.0
ARBOUT18	Able to properly plant trees & shrubs.	10	100.0
ARBOUT19	Able to determine the competencies & requirements for specific careers in the ARBORICULTURE area.	8	80.0
ARBOUT20	Able to follow proper procedures in locating, applying, & interviewing for a specific job.	7	70.0
ARBOUT21	Able to work cooperatively with others so as to enhance succeeding on the job.	9	90.0
ARBOUT22	Able to properly select & apply fertilizers & lime to trees.	10	100.0
ARBOUT23	Able to repair injured plants.	8	80.0
ARBOUT24	Able to prune trees, shrubs, & hedges properly & effectively.	10	100.0
ARBOUT25	Able to select chemicals & spray trees for insects & diseases.	9	90.0
ARBOUT26	Able to perform tree surgery adequately & effectively.	4	40.0
ARBOUT27	Able to safely climb trees using recommended procedures.	2	20.0
ARBOUT28	Able to operate & use arboriculture tools or equipment.	6	60.0
ARBOUT29	Able to take soil samples properly.	8	80.0
ARBOUT30	Able to participate effectively in speaking & conducting business in a group or organizational meetings.	3	30.0
ARBOUT31	Able to serve effectively as an officer or member of an organization.	4	40.0

SOURCE: Primary data, Robinson.

Table 52.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in the Floriculture Aspect of Ornamental Horticulture Includes Given Desired Student Outcomes.

Code	Desired Student Outcomes	Student Outcomes Included	
		No. (N=7)	%
FLOUTC43	Able to safely apply chemicals for disease & insect control.	7	100.0
FLOUTC44	Able to identify the basic parts of a plant.	7	100.0
FLOUTC45	Able to operate & maintain small gasoline engines.	3	42.9
FLOUTC46	Able to water plant materials effectively.	7	100.0
FLOUTC47	Able to identify & control insects, diseases, & pests in the greenhouse.	7	100.0
FLOUTC48	Able to fertilize plant material effectively.	7	100.0
FLOUTC49	Able to select & prepare soil or growing medium for various greenhouse plants.	7	100.0
FLOUTC50	Able to effectively pot various plants.	7	100.0
FLOUTC51	Able to transplant seedlings properly.	7	100.0
FLOUTC52	Able to determine the competencies & requirements for specific careers in the FLORICULTURE area.	6	85.7
FLOUTC53	Able to follow proper procedures in locating, applying, & interviewing for a specific job.	5	71.4
FLOUTC54	Able to work cooperatively with others so as to enhance succeeding on the job.	6	85.7
FLOUTC55	Able to maintain sanitary conditions in the greenhouse area.	7	100.0
FLOUTC56	Able to propagate plant material by various methods.	7	100.0
FLOUTC57	Able to control light, temperature, & moisture for optimum plant growth.		
FLOUTC58	Able to sterilize soil using one or more sterilizing procedures.	5	71.4
FLOUTC59	Able to identify & properly utilize common growing containers.	6	85.7
FLOUTC60	Able to identify common house & greenhouse plants.	7	100.0
FLOUTC61	Able to properly regulate plant growth with chemical growth regulators.	6	85.7
FLOUTC62	Able to design floral arrangements effectively with proper consideration for the design factors of harmony, rhythm, balance, stability, proportion, scale, focalization, and orientation.	6	85.7
FLOUTC63	Able to identify & select plant materials for floral arrangements.	6	85.7
FLOUTC64	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	2	28.6
FLOUTC65	Able to serve effectively as an officer or member of an organization.		

SOURCE: Primary data, Robinson.

Table 53.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in the Landscaping Aspect of Ornamental Horticulture Includes Given Desired Student Outcomes.

Code	Desired Student Outcomes	Student Outcomes Included No. (N=10)	%
LSOUTC17	Able to identify basic soil classes.	5	60.0
LSOUTC18	Able to safely apply chemicals for disease, insect, & weed control.	9	90.0
LSOUTC19	Able to identify the basic parts of plants.	9	90.0
LSOUTC20	Able to operate & maintain small engines.	4	40.0
LSOUTC21	Able to maintain lawns properly.	9	90.0
LSOUTC22	Able to maintain shrubs properly.	10	100.0
LSOUTC23	Able to fertilize lawns, trees, & shrubs effectively.	10	100.0
LSOUTC24	Able to control disease & insects of trees & shrubs.	10	100.0
LSOUTC25	Able to prune trees & shrubs effectively.	10	100.0
LSOUTC26	Able to plant & maintain flower borders.	10	100.0
LSOUTC27	Able to estimate labor requirements for grounds maintenance.	7	70.0
LSOUTC28	Able to determine the competencies & requirements for specific careers in the LANDSCAPING area.	9	90.0
LSOUTC29	Able to follow proper procedures in locating, applying, & interviewing for a specific job.	7	70.0
LSOUTC30	Able to read blueprints of landscape sites.	7	70.0
LSOUTC31	Able to lay-out a landscape plan.	9	90.0
LSOUTC32	Able to determine drainage needs of a landscape site.	8	80.0
LSOUTC33	Able to take soil samples properly.	7	70.0
LSOUTC34	Able to determine lime & fertilizer needs for a landscape site.	9	90.0
LSOUTC35	Able to transplant trees & shrubs.	10	100.0
LSOUTC36	Able to seed & establish lawns properly.	10	100.0.
LSOUTC37	Able to select watering equipment for a landscape site.	8	80.0
LSOUTC38	Able to determine water needs of a landscape site.	6	60.0
LSOUTC39	Able to operate & maintain landscaping tools & equipment properly.	7	70.0
LSOUTC40	Able to work cooperatively with others so as to enhance succeeding on the job.	8	80.0
LSOUTC41	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	3	30.0
LSOUTC42	Able to serve effectively as an officer or member of an organization.	3	30.0

SOURCE: Primary data, Robinson.

Table 54--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in the Greenhouse Operation and Management Aspect of Ornamental Horticulture Includes Given Desired Student Outcomes.

Code	Desired Student Outcomes	Student Outcomes Included	
		No. (N=7)	%
GOMOUT53	Able to safely apply chemicals for disease & insect control.	7	100.0
GOMOUT54	Able to identify the basic parts of a plant.	7	100.0
GOMOUT55	Able to operate & maintain small gasoline engines.	3	42.9
GOMOUT56	Able to water plant materials effectively.	7	100.0
GOMOUT57	Able to identify & control insects, diseases, & pests in the greenhouse.	7	100.0
GOMOUT58	Able to fertilize plant material effectively.	7	100.0
GOMOUT59	Able to select & prepare soil or growing medium for various greenhouse plants.	7	100.0
GOMOUT60	Able to effectively pot various plants.	7	100.0
GOMOUT61	Able to transplant seedlings.	7	100.0
GOMOUT62	Able to determine the competencies & requirements for specific careers in the GREENHOUSE OPERATION & MANAGEMENT area.	7	100.0
GOMOUT63	Able to follow proper procedures in locating, applying, & interviewing for a specific job.	5	71.4
GOMOUT64	Able to work cooperatively with others so as to enhance succeeding on the job.	6	85.7
GOMOUT65	Able to maintain sanitary conditions in the greenhouse area.	7	100.0
GOMOUT66	Able to propagate plant material by various methods.	7	100.0
GOMOUT67	Able to control light, temperature, & moisture for optimum plant growth.	7	100.0
GOMOUT68	Able to sterilize soil using one or more sterilizing procedures.	5	71.4
GOMOUT69	Able to identify & properly utilize common growing containers.	7	100.0
GOMOUT70	Able to identify common house & greenhouse plants.	7	100.0
GOMOUT71	Able to properly regulate plant growth with chemical growth regulators.	5	71.4
GOMOUT72	Able to prepare nursery stock for display.	5	71.4
GOMOUT73	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	2	28.6
GOMOUT74	Able to serve effectively as an officer or member of an organization.	3	42.9

SOURCE: Primary data, Robinson.

Table 55.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in the Nursery Operations and Management Aspect of Ornamental Horticulture Includes Given Desired Student Outcomes.

Code	Desired Student Outcomes	Student Outcomes Included (N=6)	
		No.	%
NOMOUT14	Able to identify basic soil classes.	5	83.3
NOMOUT15	Able to safely apply chemicals for disease, insects, & weed control.	6	100.0
NOMOUT16	Able to identify the basic parts of plants.	6	100.0
NOMOUT17	Able to operate & maintain small engines.	5	83.3
NOMOUT18	Able to identify, select, & plant nursery stock.	6	100.0
NOMOUT19	Able to prune & shape nursery stock.	6	100.0
NOMOUT20	Able to select nursery stock for various uses.	6	100.0
NOMOUT21	Able to estimate relative quality of nursery stock.	6	100.0
NOMOUT22	Able to suggest species & varieties to meet customer needs.	5	83.3
NOMOUT23	Able to operate & maintain nursery & garden equipment.	6	100.0
NOMOUT24	Able to determine the competencies & requirements for specific careers in the NURSERY OPERATION & MANAGEMENT area.	6	100.0
NOMOUT25	Able to follow proper procedures in locating, applying, & interviewing for a specific job.	4	66.7
NOMOUT26	Able to work cooperatively with others so as to enhance succeeding on the job.	5	83.3
NOMOUT27	Able to perform sales activities related to the selling of nursery stock & garden equipment.	4	66.7
NOMOUT28	Able to identify & control common diseases, insects, & weeds found in nursery stock.	6	100.0
NOMOUT29	Able to identify & select materials used for planting media.	5	83.3
NOMOUT30	Able to sterilize planting media using one or more methods.	4	66.7
NOMOUT31	Able to prepare shrubs for transplanting.	5	83.3
NOMOUT32	Able to propagate nursery stock by various methods.	6	100.0
NOMOUT33	Able to select & apply fertilizers for nursery crops.	6	100.0
NOMOUT34	Able to identify & select proper methods of weed control for nursery crops.	5	83.3
NOMOUT35	Able to identify & select proper methods of disease control in nursery crops.	5	83.3
NOMOUT36	Able to prepare nursery stock for display.	5	83.3
NOMOUT37	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	3	50.0
NOMOUT38	Able to serve effectively as an officer or member of an organization.	3	50.0

SOURCE: Primary data, Robinson.

Table 56.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in the Turf Management Aspect of Ornamental Horticulture Includes Given Desired Student Outcomes.

Code	Desired Student Outcomes	Student Outcomes Included No. (N=8)	%
TMOUTC15	Able to identify basic soil classes.	6	75.0
TMOUTC16	Able to safely apply chemicals for disease, pest, & weed control.	7	87.5
TMOUTC17	Able to identify the basic parts of a plant.	7	87.5
TMOUTC18	Able to operate & maintain small engines.	5	62.5
TMOUTC19	Able to prepare a turf seed bed.	8	100.0
TMOUTC20	Able to seed & establish a turf site.	8	100.0
TMOUTC21	Able to lay sod for a turf site.	6	75.0
TMOUTC22	Able to establish a turf area using stolons.	2	25.0
TMOUTC23	Able to select & apply fertilizer to an established lawn or turf site.	8	100.0
TMOUTC24	Able to identify & control common weeds in an established lawn or turf site.	8	100.0
TMOUTC25	Able to determine the competencies & requirements for specific careers in the TURF MANAGEMENT area.	7	87.5
TMOUTC26	Able to follow proper procedures in locating, applying, & interviewing for a specific job.	5	62.5
TMOUTC27	Able to work cooperatively with others so as to enhance succeeding on the job.	7	87.5
TMOUTC28	Able to identify & control common diseases in lawn grasses or other turf areas.	7	87.5
TMOUTC29	Able to mow, maintain, & water an established lawn or other turf area.	7	87.5
TMOUTC30	Able to identify & select turf grasses for a golf course, lawn, park, or recreational area.	8	100.0
TMOUTC31	Able to determine drainage problems at a turf site.	6	75.0
TMOUTC32	Able to take a soil sample.	6	75.0
TMOUTC33	Able to determine amount of water needed in a turf area.	6	75.0
TMOUTC34	Able to determine the needed frequency of watering a turf area.	6	75.0
TMOUTC35	Able to identify & apply control measures for animal pests in a turf area.	6	75.0
TMOUTC36	Able to renovate older established turf areas.	7	87.5
TMOUTC37	Able to operate & maintain turf equipment & tools.	6	75.0
TMOUTC38	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	4	50.0
TMOUTC39	Able to serve effectively as an officer or member of an organization.	3	37.5

SOURCE: Primary data, Robinson.

and holding a job, however, were mentioned much more frequently. As an average across the sub-areas, about 80 percent of the respondents checked job related outcomes. Nearly all (about 94 percent) of the 109 desired student outcomes relating to the technical content of the instructional sub-area, as listed in Tables 51 through 56, were accepted by at least 60 percent of the respondents.

The list of equipment for ornamental horticulture found in Table 57 is the same as the December 1973 Minimum-Maximum Equipment List used by the Vocational Education and Career Development Services (referred to earlier, see footnote 9) of the Michigan Department of Education and covers the areas of general horticulture and landscaping. An examination of Table 57 reveals that, in general, equipment directly related to the performance of horticultural skills--such as lawn mowers, power sprayers, soil sterilizers, and work tables--were cited as available by 50 percent or more of the respondents while items needed to maintain and repair horticulture equipment--such as small engine tools, electric drills, lubrication tools, and vises--were reported as available by less than 50 percent of the respondents.

Advanced Instruction in Agricultural Resources and/or Forestry.--Five schools offered instruction in one or both of these program areas which represented approximately 18 percent of the respondents from the sample. By contrast, the same program areas were offered by 24 percent of the 181 schools in the total population (see Table 42). As was previously noted, the program areas of agricultural resources and forestry were counted as a single program area for the purposes of the study. In addition, no sub-areas were used in the study even though each of the program areas normally have a number of sub-areas.

Table 57.--Distribution of the Availability of Selected Items of Equipment for Instructional Use in Ornamental Horticulture in Eight Michigan High Schools, 1973-74.

Equipment Item	Respondents Indicating Equipment Item was Available No. (N=8)[a]	%
Typewriter with Table	6	75
Socket Wrench Set	5	63
Drill Press	1	13
Steam Cleaner	0	0
Dwell-Tachometer	1	13
Small Engine Tool Assortment	2	25
Battery Tester & Charger	1	13
Crane, Boom Type	1	13
Impact Wrenches 1/2"	1	13
Air Compressor	2	25
Table Saw	1	13
Workbenches	3	38
Machinist Vises	1	13
Pedestal Grinder	2	25
Small Engine Analyzer	1	13
Electric Drills 3/8"	2	25
Lubrication Tool Assortment	2	25
Hydraulic Jack	1	13
Arbor Press	1	13
Tap and Die Set	2	25
Dump Cart	3	38
Cultivator	3	38
Single Disc Harrow	0	0
Power Sprayer	4	50
Equipment List	**Respondents Indicating Equipment Item was Available No. (N=8)[a]**	**%**
Garden Tractor with Accessories	2	25
Rototiller	6	75
Soil Test Kit, Student	7	88
Compost Grinder	3	38
Black Shade Cloth	2	25
Automatic Watering System	5	63
pH Meter	4	50
Sink/Counter Unit	6	75
Protective Gear for Pesticide Application	5	63
Hand Tool Set Storage Center	5	63
Scarifier	1	13
Hedge Trimmer	6	75
Lawn Mowers--Reel and Rotary Power	5	63
Soil Sterilizer	4	50
Soil Test Kit, Professional	4	50
Plant Benches	5	63
Mist System	5	63
Solubridge	0	0
Work Tables	5	63
Floral Refrigerator	5	63
Heating Cable with Thermostat	5	63
Other	3	38

SOURCE: Primary data, Robinson.

NOTE: The list of equipment for ornamental horticulture is the December 1973 Minimum-Maximum Equipment List used by the Vocational Education and Career Development Services of the Michigan Department of Education and covers the areas of general horticulture and landscaping. Respondents were asked to check all equipment listed that was available for use in the ornamental horticulture program area.

[a] Four of the 12 responding schools offering ornamental horticulture did not respond to the equipment inventory item.

Four of the five respondents indicated that their respective instruction was designed to prepare students to enter and advance in one or more specific job titles. All of the jobs listed on the instrument with the exception of "fish hatchery worker" were cited in every instance by the four respondents who trained by job title. As can be seen in Table 43, job titles in the agricultural resources and forestry program areas represented a variety of career options.

The desired student outcomes for agricultural resources and/or forestry are listed in Table 58. Outcomes related to both leadership and obtaining and holding a job drew high positive response rates. In general, the desired student outcomes relating to the technical content of the instructional area also were frequently cited. Content related outcomes were normally accepted by from three to five of the five respondents, however, outcomes related to fish and water resources were as exception. The latter were usually cited by only one or two respondents. A visual analysis of Table 58 suggests that the content of instruction in agricultural resources and/or forestry includes the use and management of forests, recreation areas, and soil and wildlife resources.

The extent to which equipment for the agricultural resources and/or forestry program areas was available in the responding schools can be found in Table 59. An analysis of the data in Table 59 revealed that equipment related to the utilization and maintenance of forest products and resources were generally the most frequently cited. The least mentioned equipment appeared to be shop items such as welders and miscellaneous tools. Items of equipment related to wildlife and water resources were also cited less frequently than forest related equipment.

Table 58.--Percentage of Respondents Indicating that Eleventh and Twelfth Grade Instruction in Agricultural Resources and/or Forestry Includes Given Desired Student Outcomes.

Code	Desired Student Outcomes	Student Outcomes Included No. (N=5)	%
ARFOUT17	Able to make a soil separates test to determine soil texture.	4	80.0
ARFOUT18	Able to determine soil texture by feel.	4	80.0
ARFOUT19	Able to identify soil classes.	4	80.0
ARFOUT20	Able to determine physical, chemical, & biological properties of soil.	4	80.0
ARFOUT21	Able to take soil samples & implement soil test recommendations.	4	80.0
ARFOUT22	Able to specify the land use or uses for a given area of land.	5	100.0
ARFOUT23	Able to identify proper land use practices for a given area of land.	5	100.0
ARFOUT24	Able to measure land effectively by various methods.	5	100.0
ARFOUT25	Able to read soil maps & aerial photos.	5	100.0
ARFOUT26	Able to perform elementary surveying using one or more methods (differential leveling, profile leveling, & topographic surveying).	5	100.0
ARFOUT27	Able to identify causes & sources of pollution for a given lake or stream.	4	80.0
ARFOUT28	Able to specify conservation practices & correct common water pollution problems.	4	80.0
ARFOUT29	Able to collect water samples & conduct various water tests.	3	60.0
ARFOUT30	Able to identify sources & causes of air pollution.	3	60.0
ARFOUT31	Able to identify food sources for common mammals & birds.	5	100.0
ARFOUT32	Able to determine fish populations in lakes, rivers, & streams.	1	20.0
ARFOUT33	Able to detect & make recommendations for correcting fish balance.	1	20.0
ARFOUT34	Able to evaluate the need for & select species for stocking farm ponds & lakes.	1	20.0
ARFOUT35	Able to control waterweeds & algae in farm ponds & lakes.	1	20.0
ARFOUT36	Able to fertilize farm ponds & lakes to improve fish production.	1	20.0
ARFOUT37	Able to identify native wildlife & gamebirds.	4	80.0
ARFOUT38	Able to identify food sources for common mammals & birds.	5	100.0
ARFOUT39	Able to conduct wildlife population & habitat surveys.	3	60.0
ARFOUT40	Able to make recommendations for the management of wildlife populations.	2	40.0
ARFOUT41	Able to use a compass to determine direction & follow a prescribed course.	5	100.0
ARFOUT42	Able to use a transit to lay-out a camp site.	3	60.0
ARFOUT43	Able to select a route & construct a nature trail for hiking and/or horseback riding and/or all-terrain vehicles.	3	60.0
ARFOUT44	Able to identify available surface water in a given land area.	3	60.0
ARFOUT45	Able to estimate water demands for a given community.	1	20.0
ARFOUT46	Able to identify & implement common irrigation methods.	1	20.0
ARFOUT47	Able to safely operate & maintain chain saws.	5	100.0
ARFOUT48	Able to use forest and/or conservation tools properly.	5	100.0
ARFOUT49	Able to administer first-aid for minor injuries.	3	60.0
ARFOUT50	Able to operate & maintain small gasoline engines.	3	60.0
ARFOUT51	Able to select & apply pesticides for the control of common insects & pests in recreational areas.	3	60.0
ARFOUT52	Able to identify common trees given a leaf, bud, seed, or complete tree.	5	100.0
ARFOUT53	Able to plant pine seedlings properly.	5	100.0
ARFOUT54	Able to plan & implement a reforestation plan.	5	100.0

ARFOUT55	Able to weed, prune, & thin an established forest.	5	100.0
ARFOUT56	Able to identify insects, diseases, & pests common to forest areas.	4	80.0
ARFOUT57	Able to select & implement control measures for forest diseases, insects, & pests.	3	60.0
ARFOUT58	Able to apply chemicals used in controlling forest diseases, insects, & pests safely.	5	100.0
ARFOUT59	Able to measure forest products accurately.	5	100.0
ARFOUT60	Able to determine species, age, or history of a standing tree.	5	100.0
ARFOUT61	Able to cruise timber stands properly & accurately.	5	100.0
ARFOUT62	Able to estimate the value of a timber stand accurately.	5	100.0
ARFOUT63	Able to select & mark trees for harvesting.	5	100.0
ARFOUT64	Able to determine the competencies & requirements for specific careers in the AGRICULTURAL RESOURCES AND FORESTRY area.	4	80.0
ARFOUT65	Able to follow proper procedures in locating, applying, & interviewing for a specific job.	4	80.0
ARFOUT66	Able to work cooperatively with others so as to enhance succeeding on the job.	5	100.0
ARFOUT67	Able to participate effectively in speaking & conducting business in a group or organizational meeting.	4	80.0
ARFOUT68	Able to serve effectively as an officer or member of an organization.	4.	80.0

SOURCE: Primary data, Robinson.

Table 59.--Distribution of the Availability of Selected Items of Equipment for Instructional Use in Agricultural Resources and/or Forestry in Four Michigan High Schools, 1973-74.

Equipment Item	Respondents Indicating Equipment Item was Available	
	No.	(N=4)[a] %
Farm Levels and/or Transits	4	100
Live Animal Traps and Cages	0	0
Hand Axes	4	100
Block and Tackle	1	25
Adding Machine and/or Calculator	1	25
Camera	2	50
Log Handling Tools	2	50
Chain Saws	2	50
Surveying Tools	4	100
Assorted Tree Saws	3	75
Cruiser Sticks	4	100
Depth Meter	1	25
Assorted Measurement Devices	2	50
Drafting & Drawing Equipment	1	25
Hand Compasses	4	100
Hand Levels	0	0
Hard Hats	2	50
Assorted Hoes, Rakes, Shovels, & Posthole Diggers	2	50
Insect Collection and Preservation Equipment	1	25
Microscopes	1	25
Assorted Pruning Equipment	3	75
Soil Auger	2	50
Soil Moisture Meter	0	0
Soil pH Test Kit	3	75
Soil Probes	4	100
Assorted Sprayers	1	25
Tractor with Assorted Implements	2	50
Tree Climbing Equipment	0	0
Tree Planting Equipment	2	50
Tree Marking Guns	2	50
Water Testing Kits	2	50
Assorted Carpentry Tools	1	25
Assorted Hand Tools for Engine & Equipment Maintenance.	2	50
Electric Arc Welder and Accessories	0	0
Oxyacetylene Torch and Accessories	0	0
Assorted Power Saws, Drills, and Grinders	0	0
Assorted Safety Equipment	2	50
Assorted Chains	1	25
Tree Injector	0	0
Assorted Equipment for Collecting and Cooking Maple Syrup	0	0
Aerial Photo Interpretation Grids	1	25
Topographic Maps	2	50
Other	1	25

SOURCE: Primary data, Robinson.

NOTE: Respondents were asked to check all equipment listed that was available for use in the agricultural resources and/or forestry program areas.

[a] One of the five responding schools offering agricultural resources and/or forestry did not respond to the equipment inventory item.

Occupational Training Patterns of Vocational Agriculture Students

Program output, a major concern in the review of high school programs of vocational agriculture, can best be understood (and measured) by first analyzing the process which results in the product or output. Consequently, it was decided to include vocational agriculture student occupational training patterns and graduate career patterns--two process features--for analyses, respectively, in this section and in a succeeding section.

The nature of the student patterns of occupation training was built around the question: To what extent do students with interests in agriculture take advantage of vocational agriculture programs available to them? Ideally, student interest should be measured by means independent of whether or not they actually enrolled in vocational agriculture. However, since that would entail measuring interest prior to entry in vocational agriculture with subsequent follow-through of students over a period of years to determine what instruction in vocational agriculture was taken, that procedure was deemed outside the scope of the study. Instead, interest in agriculture was measured by whether or not a student actually enrolled in at least one semester of instruction in vocational agriculture.

Insight into the occupational training patterns of students of vocational agriculture was gained by examining the permanent school records of 194 students from the Class of 1973 in six selected Michigan high schools who had enrolled for one or more semesters of instruction in vocational agriculture during their years in high school. The nature of instruction taken by each student was recorded for each of the eight semesters of the student's high school (grades 9-12) experience. If during a given semester a student was enrolled in vocational agriculture the student was deemed a "vocational agriculture enrollee" regardless of the nature of the other classes the student may have taken. However, if the student was not enrolled in a vocational agriculture class, but was enrolled in another reimbursed vocational class, he was considered to be a "vocational enrollee" regardless of other instruction taken. In a like manner, if the student was not enrolled in any reimbursed vocational program, but was enrolled in a class related to vocational education, the student was classified as a "vocationally related enrollee" irrespective of other instruction. An "academic enrollee" was the student who was enrolled in none of the above, but was enrolled in an academic class. In cases where the student was not enrolled (such as dropouts, expellees, and transfers) in the school for a given semester, the student was deemed to have "exited the system" but was accounted for in successive semesters whether he or she returned to school or not.

Analysis of Training Patterns.--Students first enrolled in vocational agriculture during the fall semester in an overwhelming majority of the cases. However, the year of first entry into vocational agriculture varied for the 194 students in the sample who took one or more semesters of vocational agriculture. Approximately 27, 53, 8, and 12 percent of the students first enrolled in vocational agriculture, respectively, during their freshman, sophomore, junior, and senior years.

The above percentages should be interpreted with caution because no instruction in vocational agriculture was offered at the ninth grade level in three of the six selected schools, nor at the tenth grade level in one of the selected schools. For example, only 98 of the 194 students had instruction in agriculture available during their freshman year. Of those 98 for which instruction was offered, 53 (54 percent) were actually enrolled in vocational agriculture during the first semester of their freshman year (fall 1969). Since instruction was unavailable for over one-half of the sample graduates during their freshman year, the percentage of students first enrolling during their freshman year (previously cited as 27 percent) tends to be misleading.

In general, it appears that about one-half of the students enrolled for two semesters of agriculture and then either took other courses or exited the system via graduation, dropping out of school, transfer, or related means. As evidenced in Table 60, the lowest return rate occurs after a student has completed two semesters of vocational agriculture. The return rates for the group of students who did return after one year of vocational agriculture (approximately one-half) increased significantly in the succeeding years. For example, of the 103 students who first entered vocational agriculture as sophomores, 46 (44.7 percent) were enrolled during the fall of their junior year and, of those 46 enrollees, 41 (89 percent) were enrolled during the first semester of their senior year.

A visual analysis of Table 60 for each of the years of first entry indicates that, in general, the return rate to vocational agriculture was lowest between school years and significantly higher between the semesters of a school year. However, it should be noted that only net rates of return were considered in the Table 60 analysis. A few cases were observed where the re-entry of students after a semester or more of absence resulted in a net increase in number of enrollees. However, as can be observed in Table 60, all such cases occurred between semesters rather than between school years.

It should be emphasized that the return rates of students entering in different years were analyzed separately. If the groups are combined (as in the cumulative column of Table 60), a net increase between years in all cases except between the 1970-71 and 1971-72 school years is noted.

Table 60.--Four-Year Agricultural Enrollment Patterns by Semester for 194 Vocational Agriculture Enrollees from the Class of 1973 in Six Selected Michigan High Schools, by Year of First Entry into Vocational Agriculture.

School Year by Semester	Enrollees by Year of First Entry Into Vocational Agriculture								Cumulative Totals of Enrollees	
	Freshman		Sophomore		Junior		Senior			
	No.	(N=53) %	No.	(N=103) %	No.	(N=15) %	No.	(N=23) %	No.	(N=194) %
1969-70 School Year										
Fall 1969	53	100.0	-	-	-	-	-	-	53	27.3
Spring 1970	51	96.2	-	-	-	-	-	-	51	26.2
1970-71 School Year										
Fall 1970	25	47.2	103	100.0	-	-	-	-	128	66.0
Spring 1971	27	50.6	97	94.2	-	-	-	-	124	63.9
1971-72 School Year										
Fall 1971	20	37.7	46	44.7	15	100.0	-	-	81	41.8
Spring 1972	18	34.0	43	41.7	15	100.0	-	-	76	39.2
1972-73 School Year										
Fall 1972	18	34.0	41	39.8	3	20.0	23	100.0	85	43.8
Spring 1973	19	35.8	33	32.0	2	13.3	22	95.7	76	39.2

SOURCE: Primary data, Robinson.

Data concerning the nature of occupational training patterns for the sample of 194 students are presented in Table 61. The nature of instruction taken by each student for each of eight semesters was recorded and classified into one of the five following categories or streams: (1) reimbursed vocational; (2) related vocational; (3) vocational agriculture; (4) academic; and (5) system exit. The definitions for the classifications were the same as described earlier.

The count on the number of students in the vocational agriculture stream began during the fall of 1969 with approximately one-fourth of the total number of students (53 of 194) who had enrolled in at least one semester of vocational agriculture during their high school (grades 9-12) experience. However, the 53 students represented over one-half (54 percent) of those who actually had instruction in agriculture available to them. The percentage of students in the vocational agriculture stream peaked during the 1970-71 school year (fall 1970-spring 1971) with nearly two-thirds of the total sample enrolled in vocational agriculture. During the next two years, the vocational agriculture stream stabilized with about 40 percent of the sample enrolled in vocational agriculture, although it did vary slightly as shown in Table 61. As an average across the eight semesters, about one-half of the sample was enrolled in vocational agriculture during any given semester.

In the reimbursed vocational stream, the percentage of the sample by year enrolled in a reimbursed vocational course (exclusive of vocational agriculture) started at about 1 percent during the 1969-70 school year and steadily increased to about 20 percent during the 1972-73 school year. It should be noted again, however, that only those students who had instruction

Table 61.-- Four-Year Occupational Training Enrollment Patterns by Semester for 194 Students Who Enrolled in One or More Semesters of Agriculture, in Six Selected Schools Offering Vocational Agriculture.

Semester	Student Enrollments by Instructional Stream									
	Reimbursed Vocational		Related Vocational		Vocational Agriculture		Academic		System Exit	
	No.	%	No.	%	No.	%	No.	%	No.	%
1969-70 School Year[a]										
Fall 1969 (98 freshman students)	1	1.0	22	22.4	53	54.1	21	21.4	1	1.0
Spring 1970 (98 freshman students)	1	1.0	22	22.4	51	52.0	21	21.4	3	3.1
1970-71 School Year[b]										
Fall 1970 (193 sophomore students)	7	3.6	33	17.1	128	66.3	15	7.8	10	5.2
Spring 1971 (193 sophomore students)	6	3.1	35	18.1	124	64.2	12	6.2	16	8.3
1971-72 School Year										
Fall 1971 (194 junior students)	24	12.4	51	26.3	81	41.8	10	5.2	28	14.4
Spring 1972 (194 junior students)	29	14.9	46	23.7	76	39.2	12	6.2	31	16.0
1972-73 School Year										
Fall 1972 (194 senior students)	39	20.1	28	14.4	85	43.8	4	2.1	38	19.6
Spring 1973 (194 senior students)	40	20.6	27	13.9	76	39.2	5	2.6	46	23.7
Average Percentage for the Eight Semesters		10.8		19.4		49.6		7.4		12.7

SOURCE: Primary data, Robinson.

[a] Instruction in vocational agriculture was not available for 96 of the 194 students during the 1969-70 school year.

[b] Instruction in vocational agriculture was not available for 1 of the 194 students during the 1970-71 school year.

in vocational agriculture available were included in the analyses. This factor had eliminated over one-half of the students from the analysis during the 1969-70 school year. Even so, since most reimbursed vocational programs in areas other than agriculture are not operated at the ninth grade level, the effect of eliminating those students from the analyses may be most pronounced in the three other classification streams. As an average across the eight semesters, about 11 percent of the sample was enrolled in reimbursed vocational instruction other than vocational agriculture during any given semester.

The related vocational stream included instruction in such classes as industrial arts, arts and crafts, non-reimbursed vocational courses, and avocational courses. Approximately 22 percent of the students in the sample were enrolled in related vocational classes during the 1969-70 school year. This percentage dropped to 17 or 18 percent during 1970-71, rose to over 26 percent in the fall of 1971, and fell to around 14 percent during the 1972-73 school year, for an eight-semester average of about 19 percent.

Approximately 21 percent of the students from the sample were in the academic stream during the 1969-70 school year. Over the next three years that percentage declined steadily until less than 3 percent were enrolled in school year 1972-73. Although the steady decline in the academic stream to some extent inversely approximates the steady increase noted in the reimbursed vocational stream, further study with larger samples would be required to investigate any relationship that may exist between the two instructional streams.

The system exit stream is essentially a measure of school dropouts and expulsions, even though the spring, 1973 count of 46 system exit students included 6 transfers to other schools and 1 death. A review of the data in Table 61 indicates that the percentage of the 194 students exiting the system each year steadily increased from about 2 to 6 percent each year. The figures noted represented net increases since the number of students re-entering the system was offset by the number exiting. By the end of spring semester 1973, almost one-fourth of the sample had left the school system and did not graduate (at least not during 1973).

The Extent of Occupational Training in Agriculture.--There were nc cases among the 194 students in the sample where a student enrolled in (and completed) more than one class during a single semester in vocational agriculture at the freshman and sophomore levels. At the junior level only two students out of 76 took more than one class in vocational agriculture during a single semester. However, at the senior level a substantial number enrolled in more than one class in vocational agriculture per semester. Eighty-five of the 194 (senior) students were enrolled in vocational agriculture during the fall semester of 1972. Of the 85, approximately 14 percent (12) of the students completed two classes of vocational agriculture while 7 percent (6) were enrolled in three classes of vocational agriculture. During the spring of 1973, a similar number of students took two and three classes, respectively; however, the total number enrolled in vocational agriculture dropped to 76, which in effect increased the percentage enrolling in more than one class. The average number of vocational agriculture classes taken by the senior students during the fall of 1972 was 1.28 per student, while the average number completed in the spring of 1973 was 1.34 classes per student.

Another measure of the extent of occupational training in agriculture is presented in Table 62. The average number of semesters of vocational agriculture taken by the sample of students was approximately 3.5 semesters per student irrespective of the number of classes of vocational agriculture taken per semester. As shown in Table 62, less than 5 percent of the sample enrolled for only a single semester of vocational agriculture while about 6 percent took a full eight semesters of the subject. It was noted earlier that over half of the selected schools offered only six semesters of instruction in vocational agriculture. The percentages of students in the sample who had completed two, four, and six semesters of vocational agriculture were 50, 14, and 1[illegible] percent, respectively. A breakdown of the number of semesters of vocational agriculture taken by students by year of first entry into vocational agriculture, along with other details, can be found in Table 62.

One of the assumptions in the review of school program characteristics dealt with the amount of instruction that a student needed to take in order to "successfully complete" a program in vocational agriculture. For the purposes of the study, it was assumed that a student had "successfully completed" a program in vocational agriculture if he or she had enrolled in (and completed) two or more semesters of instruction beyond the ninth grade. An individual meeting the above criterion was deemed a successful completion (see Glossary).

Approximately 85 percent (164) of the 194 students in the sample completed two or more semesters of vocational agriculture beyond the ninth grade and thus were successful completions. However, nearly 15 percent of the students who completed two semesters or more of vocational agriculture--and were included with the above 164 successful completions--were non-graduates such as dropouts, transfers, and expellees. About 70 percent of the total sample though did meet the minimum requirements in vocational agriculture and did graduate, as shown in Table 63.

Table 62.--Distribution of the Number of Semesters of Vocational Agriculture Taken by 194 Students in the Class of 1973 in Six Selected Michigan Schools by Year of First Entry into Vocational Agriculture.

Year of First Entry	Number of Semesters Vocational Agriculture Taken																	
	One		Two		Three		Four		Five		Six		Seven		Eight		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Students first entering vocational agriculture as freshman (N=53)	2	3.8	19	3.8	2	35.8	8	15.1	2	3.8	8	15.1	1	1.9	11	20.8	53	100.0
Students first entering vocational agriculture as sophomores (N=103)	5	4.9	44	3.9	4	42.7	18	17.5	6	5.8	26	25.2	-	-	-	-	103	100.0
Students first entering vocational agriculture as juniors (N=15)	1	6.7	11	6.7	1	73.3	2	13.3	-	-	-	-	-	-	-	-	15	100.0
Students first entering vocational agriculture as seniors (N=23)	1	4.3	22	95.7	-	-	-	-	-	-	-	-	-	-	-	-	23	100.0
Totals for all students (N=194)	9	4.6	96	49.5	7	3.6	28	14.4	8	4.1	34	17.5	1	.5	11	5.7	194	100.0

SOURCE: Primary data, Robinson.
NOTE: The average number of semesters of vocational agriculture taken per student was 3.47.

Table 63.--Distribution of 194 Graduating and Non-Graduating Students in the Class of 1973 in Six Selected Michigan High Schools by Type of Vocational Instructional Program Completed.

Type of Instructional Program Completed	Graduating and Non-Graduating Students by Type of Instructional Program Completed					
	Graduating Students		Non-Graduating Students		Total	
	No.	%	No.	%	No.	%
Vocational Agriculture						
A. Completed two or more semesters of vocational agriculture beyond grade nine.	136	70.1	28	14.4	164	84.5
Other Vocational Courses						
B. Did not meet conditions in (A) but did complete two or more semesters of other reimbursed vocational courses beyond grade nine.	6	3.1	2	1.0	8	4.1
Related Vocational Course						
C. Did not meet conditions in (A) or (B) but did complete two or more semesters of other vocationally related courses beyond grade nine.	6	3.1	4	2.1	10	5.2
Not Vocational						
D. Did not meet any of the conditions in (A), (B), or (C).	0	0.0	12	6.2	12	6.2
Total	148	76.3	46	23.7	194	100.0

SOURCE: Primary data, Robinson.

Those not meeting minimum requirements in vocational agriculture represented about 15 percent of the total sample. About 3 percent of the sample of 194, although not meeting minimum vocational agriculture requirements, did complete two or more semesters of other vocational courses beyond the ninth grade level and did graduate. An additional 1 percent of the sample met minimum requirements in other vocational areas but did not graduate. Of those graduates and non-graduates not meeting minimum requirements in any of the vocational courses, about 5 percent completed two or more semesters beyond grade nine in vocationally related courses. Approximately 6 percent (12 of 194) of the students did not graduate and did not complete two or more semesters beyond grade nine in vocational agriculture, in other vocational courses, or in vocationally related courses, although a number of those students trarferred to other schools.

Career Patterns of Vocational Agriculture Graduates

A second process feature studied in the analysis of vocational agriculture program output was the nature of career patterns for graduates of vocational agriculture. To obtain data with regard to the nature of graduate career patterns, a follow-up of 89 graduates of the Class of 1973 was conducted.

The sample of graduates was selected from those 194 students from the six selected schools in the Class of 1973 who were a part of the occupational training pattern analysis in the previous section. Students were chosen from the group of 194 for the follow-up if they had graduated in the spring of 1973 and had also completed one-half or more of the number of semesters of vocational agriculture offered by the school. For example, if a school offered a total of six semesters of vocational agriculture at the tenth, eleventh, and twelfth grade level (regardless of the number of types of program areas offered), a student would have had to have taken three semesters of vocational agriculture as well as to have graduated in the spring of 1973 in order to be selected for the follow-up sample.

A survey instrument (see Instrument E, Appendix G) was mailed to the 89 sample graduates during November, 1974. Approximately 27 percent (24) of the graduates completed and returned the instruments. A review of the sex and marital status of the follow-up respondents indicated they were predominately single males. Only two of the 24 respondents were married and one of the 24 was female. A few of the respondents did not reply to all of the questions on the instrument. Due to the small size of the sample and the low percentage of respondents, caution should be exercised in drawing implications from the findings that follow.

Additional Training or Education Received by the Graduates.--Almost 70 percent of the respondents reported that they had received additional training or education since high school graduation, as shown in Table 64. Since only 17 months had elapsed between graduation and completion of Instrument E, the relatively high percentage of graduates reporting additional training or education appears to be very significant. A review of the 16 respondents reporting additional training or education since graduation revealed the following numbers of individuals and types of programs: four, on-the-job training; two, military training; one, private technical school; two, community college; five, college or university; and two, other kinds of training. Of that group, about 38 percent (6) indicated they were currently (as of November 1974) enrolled in additional training or education.

Approximately 38 percent (6) also reported that their additional training or education was related to the field of agriculture. The areas of agriculture to which the respondents' additional training or education related were agricultural production, ornamental horticulture, and agricultural resources.

Employment Status of the Graduates.--Two-thirds (16) of the graduates were employed at the time of the survey, as indicated in Table 64. Seven of the eight respondents not employed were seeking employment while one respondent was unavailable for employment. Two-thirds of the respondents had also held a job related to agriculture since their graduation while 58 percent (14) were employed in an agriculturally related job at the time of survey. Of the 16 students who had held a job related to agriculture, 63 percent (10) indicated that they felt additional training would have helped them in their agriculturally related job.

One-half of the 16 respondents that had held a job related to agriculture indicated that agricultural production was the area within agriculture to which the job was most related. Three of the respondents reported their agriculturally related job was most related to agricultural mechanics while two cited ornamental horticulture as the most closely related area. One respondent each mentioned agricultural resources, forestry, and "others" as the areas to which their agriculturally related jobs were most related.

The Availability and Accessibility of Vocational Agriculture Programs

Some consideration was given to the general availability of vocational agriculture in Michigan in the previous section dealing with the

Table 64--Summary of Data From the Follow-up of 24 Responding Vocational Agriculture Graduates of the Class of 1973 from Six Selected Michigan High Schools.

Follow-up Items	Distribution of Responses for Follow-up Items				
	Yes	No	Does Not Apply	No Response	% Yes[a]
Respondent received additional training or education since graduation from high school.	16	7	--	1	69.6
Respondent enrolled for training or education at time of survey.	6	10	4	4	37.5
Additional training or education was related to agriculture.	6	10	6	2	37.5
Respondent employed at time of survey.	16	7[b]	1[c]	--	69.6
Respondent had held job related to agriculture.	16	8	--	--	66.7
Respondent employed in agriculturally related job at time of survey.	14	10	--	--	58.3
Respondent felt additional training would be beneficial in agriculturally related job.	10	6	7	1	62.5

SOURCE: Primary data, Robinson.

[a] Respondents giving a "Does Not Apply" or "No Response" reply to an individual item were not included in the calculation of the "Percentage Yes" column.

[b] Seven respondents were unemployed but were seeking employment.

[c] One respondent was unavailable for employment.

nature of programs. In contrast, this section is devoted to an analysis of the distribution, availability, and accessibility of programs of vocational education in agriculture with regard to the various school classification variables described below. Findings relative to those selected variables constitute the balance of this section.

Classification of Schools Offering Vocational Agriculture

For the purposes of this study, schools offering vocational agriculture in Michigan were classified on the basis of school size, community type, geographical location, and program type. The classification schemes for school size and community type were pre-existing while those for geographical location and program type were constructed specifically for the study.

The school size categories (A, B, C, and D) were those used by the Michigan High School Athletic Association in classifying Michigan high schools for athletic competition as of November 1973.[10] Community type categories (metro-core, city, town, urban fringe, and rural) were established previously by the Michigan Department of Education (see Glossary). The categories for geographical location (Upper Peninsula, upper Lower Peninsula, Detroit metro area, and the balance of the Lower Peninsula) take into consideration geography and type of agriculture and are bounded on Career Education Planning District (CPED) lines. Program type categories are based on the nature of the delivery system through which vocational agriculture programs were offered (e.g., local programs, shared-time programs, and related arrangements). A distribution of the schools which offered reimbursed programs in vocational agriculture in 1973-74, by each of four classification schemes, is presented in Table 65.

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[10] Michigan high schools are classified for athletic competition on the basis of total enrollments in grades 9-12, inclusive. The size limitations in effect during school year 1973-74 were: 1,410 or more (Class A); 679-1,409 (Class B); 347-678 (Class C); and less than 347 (Class D). See Michigan High School Athletic Association, Inc., Michigan High School Athletic Association Bulletin: Directory Issue 50 (November 1973).

Vocational agriculture was found to be more frequently offered in the smaller schools of Michigan. Over 75 percent of the schools offering vocational agriculture had enrollments (grades 9-12) of 1,000 or less and almost 56 percent had enrollments of less than 679. The average enrollment for the schools in the study was 879. As shown in Table 65, almost 70 percent of the schools were either Class B or C while Classes A and D accounted for about 30 percent of the schools in the study.

A majority of the schools (almost 60 percent) offering vocational agriculture were found in rural communities while less than 8 percent were located in city or metro-core communities. A substantial number (about one-fourth) were categorized as town community type schools. The urban fringe community type category applied to approximately 7 percent of the schools.

The great majority of schools offering vocational agriculture in Michigan are located in the lower half of the Lower Peninsula exclusive of the Detroit metropolitan area. This region accounted for almost 80 percent of the above schools in 1973-74. Only four schools in the Upper Peninsula and seven schools in the Detroit metro area offered reimbursed programs in vocational agriculture. Twenty-eight (about 16 percent) of the schools offering vocational agriculture were found in the upper one-half of the Lower Peninsula.

Table 65.--Distribution of the 181 Schools Which Offered Reimbursed Programs of Vocational Agriculture in Michigan in 1973-74, by School Size, Community Type, Geographical Designation, and Program Type.

Classification Scheme and Category Labels	Schools by Category	
	Number	Percentage
School Size (Enrollment, Grades 9-12)		
Class A = 1,410 or more	27	14.9
Class B = 679-1,409	53	29.3
Class C = 347-678	73	40.3
Class D = Less and 347	28	15.5
Total	181	100.0
Community Type		
Metro-core	6	3.3
City	8	4.4
Town	46	25.4
Urban Fringe	13	7.2
Rural	108	59.7
Total	181	100.0
Geographical Designation		
Upper Peninsula	4	2.2
Upper Lower Peninsula	28	15.5
Detroit Metro Area	7	3.9
Balance of Lower Peninsula	42	78.5
Total	181	100.0
Program Type (Delivery System)		
Local Program Only	91	50.3
Local Program with Access to Area Center	41	22.7
Local Program with Access to Shared-Time Program	8	4.4
Access to Shared-Time Program Only	3	1.7
Access to Area Center Only	13	7.2
Operates Shared-Time Program	21	11.6
Local Program with Area Center Designation	4	2.2
Total	181	100.0

SOURCE: Primary data, Robinson.

Over 91 percent of the schools offered instruction in agriculture through the local high school facility. Over 50 percent of the schools had local programs as the only vocational agriculture available to their students while approximately 41 percent of the schools had shared-time or area center programs at other locations available to students in addition to the program at the local school. Approximately 9 percent of the schools offered vocational agriculture instruction to their students only through shared-time or area center programs at locations other than the local school.

Additional findings regarding the availability and accessibility of vocational agriculture were obtained from analyses of the various categories for each classification area as presented below.

School Size Categories

Class A.--Class A schools represented approximately 15 percent of the schools offering reimbursed vocational agriculture instruction in 1973-74. There was a tendency for Class A schools to emphasize instruction in the areas of ornamental horticulture, forestry, and to a somewhat lesser degree in agricultural supplies, while emphasizing instruction in other program areas to a significantly lesser degree. In addition, Class A schools tended to: (1) offer instruction through an area center rather than through local or shared-time programs; (2) include FFA chapters in the instructional program significantly less often than smaller schools; (3) offer ninth and tenth grade level instruction much less frequently than smaller schools; and (4) offer approximately two agricultural program areas per school.

Class B.--Schools in this category constituted about 30 percent of those offering reimbursed instruction in vocational agriculture. Class B schools were found to offer instruction through a variety of means (i.e., local, area center, and shared-time programs) and to provide instruction in most program areas in about the same proportion as their composition of the population. However, they tended to offer forestry and agricultural co-op more frequently and agricultural products less frequently than one would expect from their relative proportions of program areas in all schools. Class B schools included FFA chapters in the instructional program in over 90 percent of the schools, offered approximately 2.5 program areas per school, and had slightly more facilities than Class C and D schools.

Class C.--Schools of this size accounted for 40 percent of those offering reimbursed instruction in vocational agriculture. Those schools tended to offer most program areas in proportion to their makeup in the population with the exception of the agricultural products program area where Class C schools accounted for two-thirds of the program offerings in that area. Furthermore, Class C schools provided instruction through a variety of means, had a high incidence of FFA chapters, offered about 2.4 program areas per school, and had slightly less facilities than Class A and B schools.

Class D.--The schools in the smallest class represented approximately 16 percent of the schools with programs of vocational agriculture. Class D schools tended to offer instruction less frequently than schools of larger class sizes in the areas of agricultural supplies, ornamental horticulture, and agricultural co-op, but were found to provide instruction in agricultural mechanics more frequently than other class schools. Class D schools offered no programs in forestry. Instruction in other program areas was provided in proportion to their composition of the population. Those schools further tended to provide instruction through a variety of means while having slightly less facilities than Class A and B schools. Class D schools had a high incidence of FFA chapters and offered approximately two program areas per school.

Community Type Categories

Metro-core.--Only a very small percentage (3.3 percent) of the vocational agriculture programs were offered in metro-core schools. Those schools: (1) provided instruction exclusively in the areas of agricultural mechanics and ornamental horticulutre, and exclusively through area center or shared-time programs; (2) excluded FFA chapters from the instructional program, and ninth and tenth grade instruction from the curricula; and (3) tended to have more facilities, and to offer fewer program options per school than other community types. Since metro-core schools operate primarily through area centers, most of the characteristics mentioned were also those of area centers.

City.--Like their metro-core school counterparts, city schools accounted for only a small percentage (4.4 percent) of all reimbursed programs of vocational agriculture in the state. City schools tended: (1) to provide instruction in agricultural supplies and forestry; (2) to offer more program area options than schools in other community types; (3) to include FFA chapters in the instructional program (88 percent did); and (4) to offer ninth grade instruction less frequently than did town, urban fringe, and rural community types.

Town.--Approximately 25 percent of the schools offering reimbursed instruction in vocational agriculture at the time of survey were in communities classified as towns. As a group they offered a substantial number of all program areas while offering approximately 2.3 program areas per school. Town schools tended: (1) to include FFA chapters in the instructional program; (2) to offer instruction at grade levels nine through twelve; and (3) to provide instruction at the local school while often supplementing such instruction through an area center.

Urban Fringe.--Schools in this category made up 7.2 percent of all Michigan schools offering reimbursed programs of vocational agriculture. Urban fringe schools were inclined toward offering instruction in ornamental horticulture and away from offering instruction in other program areas. They provided no instruction in agricultural supplies or agricultural products. In addition, urban fringe schools tended to offer instruction at grade levels nine through twelve, but included FFA chapters in the instructional program less frequently (in only about 50 percent of the cases) than did rural, town, and city community types.

Rural.--As might be expected, rural schools represented most (approximately 60 percent) of the schools offering reimbursed programs of vocational agriculture in Michigan in 1973-74. Rural schools also accounted for 75 percent of the total program offerings in agricultural products, 70 percent of those in agricultural mechanics, and 66 percent of those in agricultural production. Less but substantial emphasis was placed on other program areas with ornamental horticulture and forestry representing the least frequent program area offerings (40 and 37 percent respectively of all program offerings) by rural schools. Schools in the rural category also: (1) offered slightly over two program areas per school; (2) included FFA chapters in the instructional program in almost all (96 percent) of the schools; (3) were similar to town and urban fringe schools in offering instruction at the local school while in many cases supplementing such instruction through area centers; and (4) included instruction at grade levels nine through twelve in over 95 percent of the cases.

Geographical Designation Categories

Upper Peninsula.--It was previously noted that only four schools offered vocational agriculture instruction in the entire Upper Peninsula. Those four represented 2.2 percent of the 181 schools in the population of this study. In general, the Upper Peninsula schools offered the various program areas in about the same proportion (1 to 3 percent) as their makeup (2.2 percent) in the population of schools. However, two of the four schools had instruction in the forestry program which accounted for 12 percent of all program area offerings in forestry.

Upper Lower Peninsula.--Schools providing instruction in vocational agriculture in the upper one-half of the Lower Peninsula accounted for about 16 percent of all schools offering vocational agriculture in Michigan in 1973-74. Such schools tended to offer instruction in agricultural products and ornamental horticulture proportionately less frequently and instruction in agricultural resources and forestry proportionately more frequently than typically found among the total population of vocational agriculture programs. Upper Lower Peninsula schools accounted for only about 8 percent of both the agricultural products and ornamental horticulture program area offerings while representing about 29 and 37 percent of the agricultural resources and forestry program areas, respectively.

Detroit Metro Area.--Although the Detroit metropolitan area schools that offered vocational agriculture represented only about 4 percent of the 181 schools in the population, they accounted for about 9 percent of the program area offerings in ornamental horticulture. In fact schools in the Detroit metropolitan area offered instruction in vocational agriculture almost exclusively in the program area of ornamental horticulture. Only one school in this geographical area provided instruction in any other program area of agriculture.

Balance of the Lower Peninsula.--As noted earlier, schools in the lower half of the Lower Peninsula offering instruction in vocational agriculture accounted for nearly 80 percent of such schools in Michigan. Schools in this area generally offered the various program areas of agriculture in proportion to their composition in the population. However, those schools accounted for only about 50 percent of the program area offerings in forestry, which was substantially less than their makeup in the population (80 percent).

Program Type (Delivery System) Categories

Local Program Only.--Schools in Michigan offering instruction in vocational agriculture only to their own students and only through the local school facilities accounted for about 50 percent (91 of 181) of the school population. In schools with local-program-only delivery systems, almost all of the various program areas were offered more frequently than the makeup of the schools in the population. In other words, such schools generally accounted for more than 50 percent of the offerings in each program area. Schools of this program type represented percentages of program area offerings ranging from 48 percent in the ornamental horticulture area to 63 percent in the agricultural resources area.

Local Program with Access to an Area Center.--About 23 percent (41) of the 181 schools in this study had instructional delivery systems of this type. Those schools offered agricultural production and agricultural products in proportion to their composition in the population but accounted for less of the offerings in ornamental horticulture, agricultural mechanics, and agricultural resources (about 14 to 18 percent). In addition, those schools accounted for only 6 percent of program offerings in each of the three areas of agricultural supplies, agricultural co-op, and forestry. This was substantially less than their makeup in the population.

Local Program with Access to a Shared-Time Program.--Only about 4 percent (8 schools) of the population had delivery systems of this type. In general, those schools represented from 3 to 8 percent of various program areas. This approximated their composition in the population.

Access to Shared-Time Program Only.--Less than 2 percent (3 schools) of the population fell into this program type. One of the schools had an agricultural production program available to their students while two had agricultural co-op programs available.

Access to an Area Center Only.--Seven percent (13) of the schools in the population had vocational agriculture at an area center as the only instruction in agriculture available to their students. The schools in this category generally accounted for from 2 to 8 percent of the instruction in all program areas with the exception of ornamental horticulture. In that program area, those schools represented 17 percent of all ornamental horticulture program area offerings in Michigan. This substantially exceeded their composition in the school population (7 percent)

Operates Shared-Time Program.--About 12 percent (21) of the school population operated shared-time programs in vocational agriculture. In general, all program area offerings except agricultural supplies were found in those schools in percentages approximating their makeup in the population. Offerings by those schools in the agricultural supplies area accounted for about 28 percent of total offerings by the school population in that program area.

Local Program with Area Center Designation.--Slightly over 2 percent (4) of the schools offering vocational agriculture in Michigan also had area center designations which permitted students in surrounding schools accessibility to instruction in vocational agriculture. Three of those four schools offered instruction in forestry which accounted for about 19 percent of all forestry program offerings in Michigan. Other program areas were either not offered by those schools or were present in numbers approximating the percentage represented by the four schools (2 percent) in the population of 181 schools.

Typical Characteristics of Vocational Agriculture Programs in Michigan

A comprehensive summary of the school program review findings would add numerous pages to an already lengthy chapter. Instead, the status and availability of vocational agriculture programs in Michigan is summarized below through a series of descriptive statements regarding the most typical teacher, student, graduate, and program characteristics. This approach is intended to capture the general thrust and flavor of programs of vocational education in agriculture within the state of Michigan while at the same time not sacrificing accuracy for the sake of brevity.

The reader is cautioned, however, that the following statements represent only the average or most frequently occurring characteristics of programs without due consideration to the range of each characteristic. Nonetheless, these statements are descriptive of the general direction of vocational agriculture programs in Michigan.

1. The typical vocational agriculture program was found in a Class C school located in a rural community in the lower half of the lower Peninsula.
2. Instruction in the typical program was delivered through facilities in the local school although additional instruction was available in many cases through shared-time and area center facilities.
3. The average K-12 enrollment in schools offering vocational agriculture was approximately 2,900 while the 9-12 enrollments averaged about 880.
4. The average unduplicated enrollment in vocational agriculture programs was approximately 73 per school while program enrollees (inclusive of those taking more than one class of vocational agriculture) per school averaged slightly over 100.
5. The typical program of agriculture had about five (4.8) sections of instruction offered with an average of 22 enrollees per section.
6. The most frequently offered program areas were agricultural production, agricultural mechanics, and ornamental horticulture, in descending order of frequency.

7. Typically, instructional programs in vocational agriculture were offered at grades nine, ten, eleven, and twelve.
8. Neither adult nor young farmer instruction was offered in the typical program.
9. Among the components generally included in programs of vocational agriculture were on-farm and off-farm occupational experience programs, FFA chapters, and summer programs.
10. Facilities for vocational agriculture programs most commonly included a classroom for vocational agriculture use only (with accompanying classroom storage space), an office for the vocational agriculture teacher, a land laboratory, a school forest, and a farm shop with shop storage space.
11. Laboratory space specifically designated for a particular program area was more frequently available in agricultural production, agricultural mechanics, and ornamental horticulture, in that order.
12. The typical teacher of agriculture utilized over two-thirds of the regular school day for instruction in agriculture--teaching five sections of agriculture while using about 19 percent of the regular school day for related vocational agriculture activities such as planning and student conferences.
13. The typical teacher of agriculture used approximately 13 percent of the regular school day in activities unrelated to the vocational agriculture program.
14. On the average, the teacher of agriculture reported participating in over 100 FFA activities per year which involved a total of nearly 200 hours outside the regular school day.

15. On the average, the teacher of agriculture reported spending over 300 hours (most of which occurred outside the regular school day) per year in the supervision of occupational experience programs.

16. The typical teacher of agriculture did not utilize selection criteria for students entering the vocational agriculture program at either the ninth or eleventh grade level.

17. Typically, teachers of agriculture felt that ninth and tenth grade instruction provided basic skills needed for entry into advanced instruction at the secondary level.

18. Teachers of agriculture typically reported including awareness of career opportunities, exploration of occupations, development of prevocational skills, and development of specific knowledges and vocational skills as components of their ninth and tenth grade instructional objectives.

19. Teachers of agriculture normally felt that their eleventh and twelfth grade instructional programs were designed to provide skills for occupations which may require additional (post-secondary) instruction for the student to reach entry level.

20. Typically, teachers of agriculture reported that their eleventh and twelfth grade instructional programs were designed to train students to enter and advance in one or more specific job titles.

21. The typical student in the occupational training pattern sample completed approximately four semesters of vocational agriculture.

22. Approximately 85 percent of the students in the occupational training pattern sample completed at least two semesters of vocational agriculture beyond the ninth grade level.

23. Nearly 70 percent of the graduate follow-up respondents reported receiving additional education or training during the seventeen-month period following their high school graduation.

24. About 70 percent of the graduate follow-up respondents also reported they were employed at the time of the survey while about two-thirds indicated they had held a job related to agriculture since graduation from high school.

CHAPTER V

STUDENT INTERESTS AND ASPIRATIONS IN AGRICULTURE

Objective Question 3: What are the congruencies and discrepancies in existing vocational agribusiness and natural resources programs in terms of: (1) jobs available, programs of instruction available, and career patterns; and (2) competencies needed for job-entrance and competencies being developed in the present programs?

It was apparent at the project outset that some assessment of the current agricultural interests and aspirations of today's high school students--for these students are tomorrow's prospective job entrants--would contribute to measurement of the congruencies and discrepancies within school programs as well as those between school programs and the job market (as stated in Objective Question 3 above). Subsequently, assessments were made of the agricultural interests and aspirations of some Michigan tenth graders during school year 1974-75.

This chapter, like the previous one, represents a portion of the program review component of the overall project (Part Three). The primary purpose of Chapter V is to summarize and report those findings relative to student interests and aspirations in agriculture. As such, this chapter is an indirect response to Objective Question 3, with implications for Part (1) of the above Question.

Objectives

As stated in the previous chapter, the attainment of three sub-objectives was viewed as a necessary precondition for the achievement of the broadly stated primary objective for the program review component. Two of the three sub-objectives were the subject of the previous chapter. The student interests/ aspirations portion of the third sub-objective provided the focus for Chapter V. This sub-objective was:

3. To determine the degree of congruency and discrepancy between the characteristics of the present vocational agriculture program and the evidence of need based on manpower demand, required competencies, and student interests/aspirations.

In response to the student interests/aspirations part of the above sub-objective, collective answers to four basic questions were sought from data collected from students attending public high schools in Michigan. Those questions were:

1. What percentage of the students have their highest vocational interest in agriculture?
2. In which specific occupational area within the broad field of agriculture are students most interested?
3. What percentage of the students would select instruction in agriculture as their first vocational program choice?
4. What percentage of students would select agriculture as their first occupational choice?

Methodology and Procedures

The survey of student vocational interest in agriculture assessed the agricultural interests of students in high schools with, and in those without, reimbursed programs of vocational education in agriculture. The survey was conducted in two parts. The specific procedures used were as described in the following paragraphs.

Instrumentation

Two different survey instruments--the Ohio Vocational Interest Survey and the Michigan Occupational Preference Survey in Agriculture--were used to obtain the student interest/aspiration data as identified by the four questions in the preceding section. Details regarding the nature, purpose, and selection of each instrument are presented below.

The Ohio Vocational Interest Survey (OVIS).[1]--This is a nationally standardized survey instrument designed to assist students in grades eight through twelve with their educational and vocational plans. The OVIS combines an Interest Inventory and a Student Information Questionnaire into a single machine scorable booklet. The Interest Inventory profiles a student's interest along 24 occupational interest areas or scales (one of which is labeled "Agriculture") according to the student's responses to 280 job activity items. Students are asked to respond to each item on the basis of their degree of like or dislike for each activity as they consider it as something they would do as part of a full-time job. The Student Information Questionnaire gathers various background information including the student's occupational plans and high school vocational program preferences.

The OVIS was used in this study to determine which percentages of students: (1) had their highest vocational interest in "Agriculture" (see Question 1); (2) would select vocational agriculture over other high school vocational programs (see Question 3); and (3) would select "Agriculture" as their first occupational choice (see Question 4).

The OVIS, like most vocational interest inventories, is too conservative with regard to the broad spectrum of agricultural occupations and keys several

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[1] Published by Harcourt Brace Jovanovich, Inc.

(13, in the opinion of the writer) agricultural job activities with occupational categories other than "Agriculture". However, despite these shortcomings, the OVIS was selected because of its relatively common usage (in comparison with other standardized interest inventories) by Michigan high schools. This facilitated acceptance by school officials in allowing their schools to participate in the study and simplified procedural matters in administering the survey to large numbers of students.

Another important factor in selecting the OVIS was its structural similarity with the Michigan Occupation Preference Survey in Agriculture (MOPSA). This factor heightened the comparability of the data generated by the two instruments.

The Michigan Occupational Preference Survey in Agriculture (MOPSA).--This preference survey was developed by Dr. H. Paul Sweany at Michigan State University to provide a means for assessing a student's interest in seven occupational groups within the broad field of agriculture. The survey consists of 98 job activity items; 14 from each of 7 occupational areas. Using a format similar to the OVIS, students are asked to mark their response on a five-option Likert-type scale that best describes how much they like or dislike to perform each activity. Although not yet fully standardized, the MOPSA has been revised and administered to several hundred vocational agriculture students in Michigan. A copy of the MOPSA survey instrument with directions for administering and for interpreting results is included in Appendix H.

The purpose for using the MOPSA in this study was to identify the extent of student interest in those specific occupational area(s) within the broad field of agriculture (see Question 2).

The MOPSA was selected because its design enabled it to be used as a supplement to other interest surveys, particularly with the OVIS. Additionally, since it was developed for Michigan agricultural conditions, the MOPSA was preferred to other occupational preference surveys in agriculture.

Sample Selection

The population for the student interest in agriculture survey consisted of all tenth grade students enrolled in public senior high schools in Michigan during fall semester of 1974. According to the Michigan Department of Education, a total of 173,641 students were so enrolled during school year 1974-75 in 527 high school districts.

Student agricultural interests and aspirations were assessed at the tenth grade level for the following reasons:

1. Student interest data obtained during the ninth or tenth grade levels of instruction have greater potential for planning guidance services and curriculum changes that will benefit the surveyed students while they are still in high school than do data obtained at later grade levels.
2. Some high schools had no ninth grade, offering instruction in grades ten through twelve only.
3. It is usually at the tenth grade level when the decision is made to send a student to an area center for his or her last two years of secondary level instruction.
4. Most of the schools that were already using the OVIS surveyed their students at the tenth grade level. Hence, more data could be obtained per project dollar at the tenth grade level than at any other level.

A representative cluster or stratified sampling procedure was used to select 12 Michigan high schools for assessment of the vocational interests and aspirations of their tenth grade students. The 527 Michigan public high school districts were first grouped into two clusters, those offering reimbursed programs of instruction in vocational agriculture at the sophomore level and those not having such instruction available to tenth graders. Each of the two clusters were then grouped by school into five sub-clusters on the basis of community type (see Glossary). The schools were further identified by Career Education Planning Districts (CEPDs). For ease of data collection and to allow for possible comparisons between schools within a CEPD, an attempt was made to select two CEPDs which met the following criteria:

1. Contained schools of various community types that offered vocational agriculture and also schools of those same community types that offered no vocational agriculture at least not at the sophomore level.
2. Were representative of the high school (sophomore level) population in Michigan.
3. Were located in geographical areas that are representative of the major agricultural regions of the state.

No two CEPDs could be identified that met all of the above criteria. CEPD 23 (Saginaw County) and CEPD 33 (Ottawa County), though not meeting all of Criterion 1, were selected because they appeared to be representative both of the more populous southern one-half of the Lower Peninsula and of the major agricultural regions of the state. Nine of the schools included in the interest survey were located in CEPDs 23 and 33, as shown in Figure 3. One high school in each of three additional CEPDs was also included to strengthen the representativeness of the sample. Alpena High School (CEPD 9) was selected as being representative of northern Michigan, both agriculturally and demographically, while Battle Creek Central High School (CEPD 36) and Pontiac Central High School (CEPD 39) were chosen because of their metro-core community types and geographical locations (see Figure 3).

The sample included the tenth grade students from four high schools which offered instruction in vocational agriculture at the sophomore level and from eight schools which did not.[2] For comparative purposes, the four schools in the first cluster were paired according to community type with four of the eight schools in the second cluster. The remaining four schools in the sample were metro-core schools that offered no local instructional programs in vocational agriculture, but did offer a few instructional program options in agriculture at the eleventh and twelfth grade levels through area centers. The number of sample schools by community types are presented in Table 66.

Data Collection

The Ohio Vocational Interest Survey (OVIS).--The OVIS was administered to those tenth grade students who were enrolled in the 12 sample schools during fall semester 1974. The combined sophomore enrollment for the 12 schools was estimated at 5,182, or 3.4 percent of the total tenth grade enrollment in Michigan public schools during school year 1974-75. Approximately 86 percent (4,441) of the sample school sophomores fully completed the OVIS. Another 2.5 percent (13) completed portions of the OVIS but omitted the Interest

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[2] It was originally planned to include five schools that offered tenth grade vocational agriculture (one from each community type); however, as was reported in the previous chapter, no metro-core high school in Michigan was found to offer vocational agriculture below the eleventh grade level. See Appendix L for a list of the schools whose students were included in the student interest surveys.

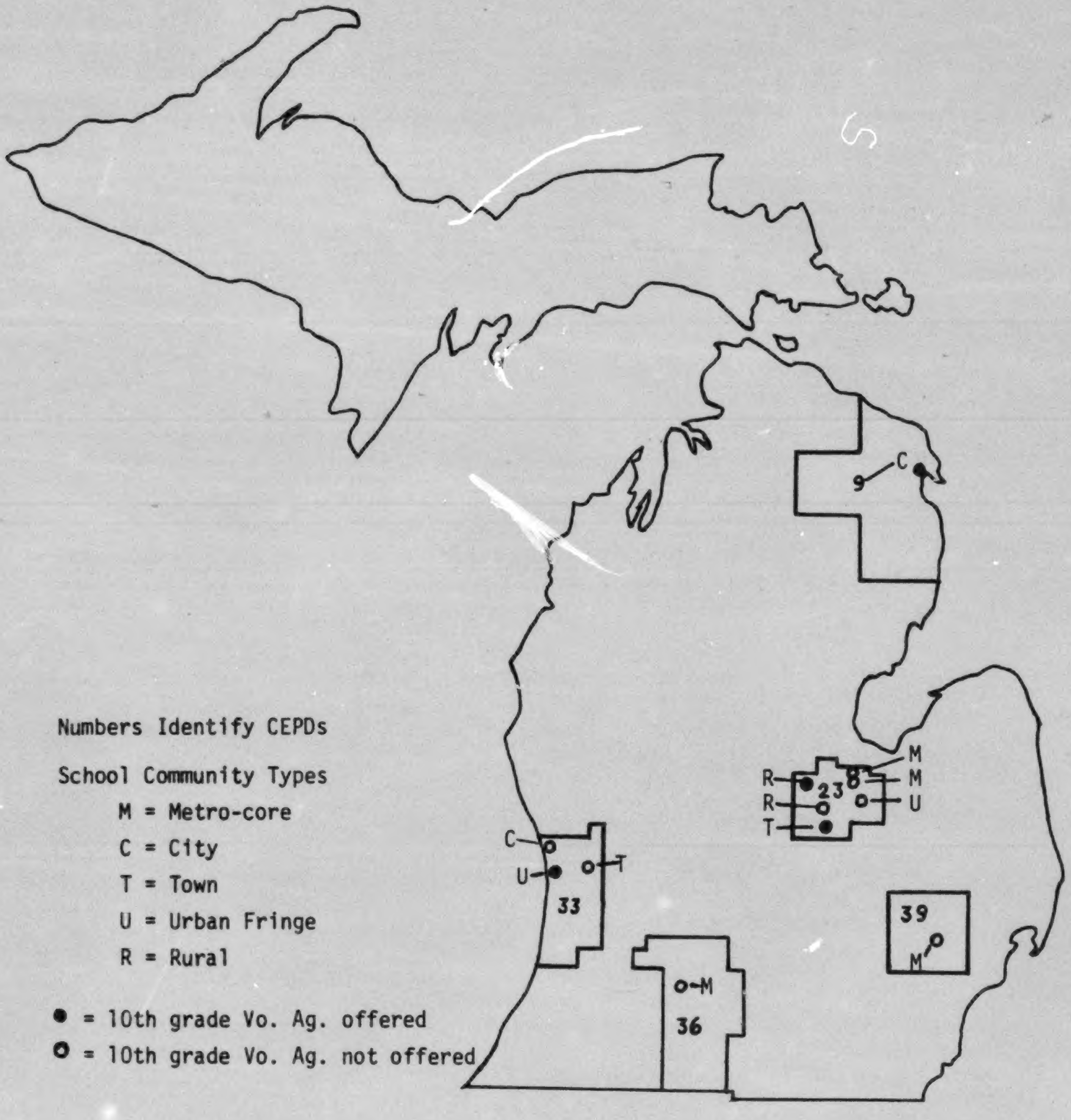
Numbers Identify CEPDs
School Community Types
M = Metro-core
C = City
T = Town
U = Urban Fringe
R = Rural
● = 10th grade Vo. Ag. offered
○ = 10th grade Vo. Ag. not offered
C
M
R
23
M
R
U
T
C
U
T
33
39
M
M
36

Figure 3.--Location, Community Type, and Program Offering Relative to Agriculture of the 12 Schools Included in the Student Interest Survey Sample.

Table 66.--Number of Sample Schools Included in the Survey of Student Vocational Interests in Agriculture by Community Type.

Community Type	Number of High Schools in the Sample With Vocational Agriculture	 Without Vocational Agriculture
Metro-core	0	4[a]
City	1	1
Town	1	1
Urban Fringe	1	1
Rural	1	1
Total	4	8

[a] Vocational agriculture was not offered at the tenth grade level in the selected metro-core schools, but was available at the eleventh and twelfth grade levels through area centers.

Inventory section of the survey instrument. The remaining 11.5 percent were unavailable at the time of survey and consequently were excluded from the study.

The OVIS data were recorded on MRC (machine scorable) answer sheets and processed by the Harcourt Brace Jovanovich Scoring Center. This scoring service provided Student Report Folders containing the OVIS profile of each surveyed student and Summary Reports of student data for each of the 12 schools in the sample. The Student Report Folders indicated, among other factors, the student's vocational interest scale score in "Agriculture" while the Summary Reports revealed the numbers and percentages of students who would choose vocational agriculture over other vocational programs and select "Agriculture" as their first occupational choice. A sample copy of each of the two OVIS reports was included in Appendix I.[3]

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[3] Written permission for inclusion of the OVIS reports was granted from Harcourt Brace Jovanovich.

The Michigan Occupational Preference Survey in Agriculture (MOPSA).[4]--In contrast to the OVIS, the MOPSA was administered only to those high schools with tenth graders who were currently enrolled in reimbursed programs of vocational agriculture. Only 4 of the 12 schools in the sample met this criterion and were subsequently included in the MOPSA survey.[5] A total of 140 tenth grade vocational agriculture students in the four schools completed MOPSA. This group accounted for approximately 3.5 percent of the total sophomore enrollment in high school vocational agriculture programs during school year 1974-75.

A distribution of the students who completed MOPSA and/or OVIS, by enrollment in schools with and without agriculture and by community type, is shown in Table 67. Because of scheduling problems only 89 of 140 students who completed MOPSA also completed OVIS.

Method of Analysis

Computer programs were developed and used in the analysis of OVIS data. Numbers and percentages of tenth graders were determined for three OVIS variables: Highest OVIS Scale Score in "Agriculture"; Vocational Program--Agricultural Program First Choice; and Occupational Plans--"Agriculture" First Choice. Composite figures were computed and reported for each of the three OVIS variables by schools offering reimbursed programs in vocational agriculture and by those schools not offering agriculture. In addition, the OVIS data from schools with agricultural programs were reported separately for those students actually enrolled in vocational agriculture (i.e., MOPSA tested) and for those students not so enrolled (i.e., not MOPSA tested).

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[4] Most of the MOPSA data collection and analysis procedures were developed and conducted by Mr. Boyd F. Robinson, Jr., as part of his role as coordinator of the school program characteristics component of the study.

[5] See Appendix L for the names of the four participant schools. Two of the schools offered instruction in agricultural production only, one in both agricultural production and ornamental horticulture, and one in ornamental horticulture only.

Table 67. Distribution of Tenth Graders, Who Completed the MOPSA and/or the OVIS, By Enrollment in Schools With and Without Agriculture and By Community Type, 1974-75.

Community Type	MOPSA Completions		OVIS Completions			
	In Schools With Agriculture		In Schools With Agriculture		In Schools Without Agriculture	
	No. (N=140)	%	No.	%	(N=4,441) No.	%
Metro-core	-	-	-	-	2,076	46.8
City	50	35.7	717	16.1	410	9.2
Town	60	42.9	68[a]	1.5	199	4.5
Urban Fringe	18	12.8	323	7.3	331	7.5
Rural	12	8.6	166	3.7	151	3.4
Total	140	100.0	1,274	28.6	3,167	71.4

NOTE: The number of OVIS completions (1,274) in the schools with agriculture plus those (3,167) in the schools without agriculture equals 4,441 (100 percent) of the total full completions. An additional 130 students took the OVIS but failed to complete the Interest Inventory portion of the instrument.

[a] Only a 25 percent sample of this school's tenth graders were available for the OVIS. The sample was drawn by selecting every fourth name from an alphabetized roster of the sophomore class.

The figures for the Highest OVIS Scale Score in "Agriculture" were broken down for analysis by community type and by individual school. However, the tabular data from those analyses were omitted from this report in order to maintain the degree of anonymity desired by the participating schools.

The numbers and percentages of students by Highest Agricultural Interest Area/MOPSA Scale were hand tallied directly from the raw scale scores of the 140 MOPSA survey instruments completed by tenth graders enrolled in vocational agriculture.

Sex was not a variable in the analysis of OVIS and MOPSA data.

Although the basic methods of analysis for OVIS and MOPSA data were similar, the procedures for handling highest scale score ties differed for the two surveys. For example, if the respondent's highest OVIS scale score was a tie between "Agriculture" and one or more other OVIS scales, then the student was counted in full as having his or her highest OVIS scale score in "Agriculture". On the other hand, if the respondent's highest MOPSA scale score was a tie between two scales--e.g., "Agribusiness" and "Forestry", then both scales were credited with one-half of a point each. In other words, the tie value was shared among scales only in the case of MOPSA data.

Discussion of Findings

General Student Vocational Interest in Agriculture

Highest OVIS Scale Score in "Agriculture".--Nearly 1 out of every 13 tenth graders, or 7.6 percent of the 4,441 students who fully completed OVIS, had their highest job activity or vocational interest in "Agriculture", as shown in Table 68. In light of the 24 occupational scales on the agriculturally conservative OVIS Interest Inventory, the 7.6 percent figure would not be considered significant if the sample were predominately males enrolled in medium sized Michigan high schools--which was not the case in this study. However, 7.6 percent does become a significantly high level of interest when one considers that approximately one-half of the students in the sample were female and nearly three-fourths (72 percent, see Table 67) of the respondents attended metro-core or city schools.

One can observe from Table 68 that the percentage of tenth graders with "Agriculture" as their highest OVIS scale score was greater for those enrolled in schools offering agriculture (10.4 percent) than it was for their counterparts in the schools not offering agriculture (6.4 percent). However, a further analysis of data (omitted from this report) revealed that the four percent difference between the scale scores of the students in the two groups of schools was due almost entirely to the influence of the four metro-core schools. When the metro-core schools were removed from the sample of schools not offering agriculture, the percentage of tenth graders with their highest occupational interest score in "Agriculture" rose to 9.9 percent, or to nearly that of the students in the schools offering vocational agriculture.

Geographical location and community type appeared to be greater predictors of the percentage of students expected to have high vocational interest in agriculture than whether or not a school offered instruction in vocational agriculture.

Although the metro-core schools had a lowering effect on the non-agriculture school percentages as a group, a surprising 4.6 percent of their sophomores (1 out of every 22) had their highest OVIS scale score in "Agriculture". This percentage was higher than anticipated and, in view of the large enrollments in metro-core schools in the state, was considered to be a significant finding.

Table 68.--Distribution of Tenth Grade Students Indicating a Vocational Interest in Agriculture as Measured by the Ohio Vocational Survey (OVIS), 1974-75.

Item	In Schools Offering Reimbursed Programs In Vocational Agriculture				Totals For Schools Offering Vocational Agriculture		In Schools Not Offering Vocational Agriculture		Totals For All Schools Combined	
	MOPSA Tested (Enrolled in Vocational Agriculture)		Not MOPSA Tested (Not in Vo. Ag.)[a]				MOPSA Not Administered			
	No.	%	No.	%	No.	%	No.	%	No.	%
	(N=89)		(N=1,185)		(N=1,274)		(N=3,167)		(N=4,441)	
Highest OVIS Scale Score in "Agriculture"	36	40.4	97	8.2	133	10.4	203	6.4	336	7.6
	(N=89)		(N=1,188)		(N=1,277)		(N=3,294)		(N=4,571)	
Vocational Program--Agricultural Program First Choice[b]	34	38.2	77	6.5	111	8.7	203	6.2	314	6.9
Occupational Plans--"Agriculture" First Choice	25	28.1	63	5.3	88	6.9	138	4.2	226	4.9

NOTE: The Interest Inventory section of the OVIS was not fully completed by 130 of the 4,571 students in the survey. Those incompletions were subsequently omitted from Highest OVIS Scale Score in "Agriculture", accounting for the difference in sample sizes (N) between the first and last two items.

[a] In general, those students who were not enrolled in vocational agriculture did not take the MOPSA. A few vocational agriculture students, however, were absent on the day of MOPSA testing and therefore are included in this category.

[b] Vocational program categories "General Agriculture" and "Forestry, Landscaping, or Horticulture" were combined into one.

The data presented in Table 68 indicate that approximately two-fifths (40.4 percent) of the tenth graders enrolled in vocational agriculture, who completed both the MOPSA and the OVIS, had their highest OVIS scale score in "Agriculture" as compared with 8.4 percent of their classmates in the same four schools who were not enrolled in vocational agriculture (not MOPSA tested). At first glance, the percentage of vocational agriculture students with their highest vocational interest in "Agriculture" appeared significantly low; however, a further analysis of the OVIS data (not reported in tabular form) indicated that most of the vocational agriculture students in the sample had high interest scale scores in their field of enrollment. "Agriculture" was the second and third highest OVIS scale score for 13.5 and 10.1 percent, respectively, of those vocational agriculture students surveyed. Also, the interest score in "Agriculture" for 73 percent of the vocational agriculture tenth graders ranked among their top five OVIS scale scores. It was apparent though that about one-fourth of the tenth grade vocational agriculture students in the survey had low job activity or vocational interest in "Agriculture" relative to other OVIS scales or occupational areas.

Agricultural Program First Vocational Program Choice.--On the OVIS Student Information Questionnaire students were asked to look at a list of 24 business and vocational programs available in many high schools and to select their first choice of program from the group. "General Agriculture" and "Forestry, Landscaping, or Horticulture" were 2 of the 24 choices. Both were considered as vocational agriculture programs and subsequently were combined and analyzed as one program area. As shown in Table 68, nearly seven (6.9) percent of the 4,571 tenth graders who completed the OVIS picked one of the two agricultural areas as their first program choice.

A review of the student response data to the "vocational program--agriculture first choice" item in Table 68 shows that the percentages of responses for the various student categories were slightly less than, and closely parallel to, those reported for Highest OVIS Scale Score in "Agriculture". Agricultural programs were selected as vocational program first choices by 8.7 percent of the tenth graders in the schools offering agriculture and by 6.2 percent of the sophomores in the schools without agricultural programs.

The greatest differences between Highest OVIS Scale Score in "Agriculture" and Vocational Program--Agricultural Program First Choice occurred among students attending the four schools which offered vocational agriculture. As reported in Table 68, agricultural programs were the vocational program first choices of only 38.2 percent of the vocational agriculture students and by 6.5 percent of their classmates who were not enrolled in vocational agriculture (not MOPSA tested). These figures were 2.2 percent and 1.7 percent lower, respectively, than were the two student groups' percentages for Highest OVIS Scale Score in "Agriculture". Furthermore, the combined percentage of vocational agriculture students with agricultural programs as their first and second vocational program choices (49.4 percent) was 4.5 percent lower than their combined percentage of the highest and second highest OVIS scale scores in "Agriculture" (53.9 percent).[6] This margin between highest vocational interest and vocational program choice, although relatively small, may indicate that the agricultural program areas available in a particular respondent's school were not consonant with their specific agricultural interest area(s).

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[6] The data for Second Highest OVIS Scale Score in "Agriculture", Vocational Program--Agricultural Program Second Choice, and Occupation Plans--"Agriculture" Second Choice were obtained in the survey but were not reported in tabular form.

First Choice Occupational Plans in "Agriculture".--In a related OVIS Student Information Questionnaire item, students were asked to select from a list of 27 job activities the one activity which best described the kind of work they would like to do for a living. The 27 activities were keyed to 24 occupational areas, 1 of which was "Agriculture (and related biological fields)". Nearly 1 out of every 20, or 4.9 percent of the 4,571 tenth graders who responded, selected "Agriculture" as their first choice of occupational plans These data are presented in Table 68.

Further analysis of the data shows that only 28.1 percent of the tenth grade vocational agriculture students in the sample selected "Agriculture" as their first occupational choice. Such a low percentage of students with occupational plans or preferences in their vocational program area of enrollment prompted a review of their second occupational choices. Although not reported in Table 68, 14.6 percent of the vocational agriculture sophomores indicated "Agriculture" as their second occupational preference. Still, when combined, only a little over two-fifths (42.7 percent) of the tenth graders in the sample had first or second occupational choices in "Agriculture". This low percentage was partially attributed to the sophomore grade level of the respondents; e.g., one would normally expect a larger percentage of students to be enrolled in vocational agriculture for career awareness or exploration purposes at the tenth grade level than at the eleventh and twelfth grade levels. Nonetheless, this finding regarding the occupational preferences of sophomore vocational agriculture students was considered significant.

The balance of the occupational plans data in Table 68 shows that 6.9 percent of the sophomores in schools offering agriculture and 4.2 percent of their counterparts in the schools not offering agriculture indicated

"Agriculture" as their first occupational choice. Similar choices were made by 5.3 percent of the sophomores attending schools that offered vocational agriculture, but who were not themselves enrolled in agriculture (not MOPSA tested).

The numbers of students with first choice occupational plans in "Agriculture" in each of the five categories in Table 68 were consistently about one-third fewer than the numbers of students with their highest scale score in "Agriculture". This difference (between Highest OVIS Scale Score in "Agriculture" and Occupational Plans--"Agriculture" First Choice) was interpreted as being a crude index of avocational interest in "Agriculture" among tenth graders. In other words, about one-third of the students who had their highest interest scale score in "Agriculture" appeared to be primarily interested in "Agriculture" for avocational rather than for vocational purposes.

Vocational Agriculture Student Interest Within Agriculture

The MOPSA was administered to 140 tenth graders, who were enrolled in vocational agriculture in the four sample schools which offered instruction in agriculture, in order to learn which specific occupational areas within agriculture held the greatest interest for students. The results of this survey are reported in descending rank order in Table 69.

Job activities in "Production Agriculture" were preferred by nearly one-third (31.4 percent) of the tenth graders in vocational agriculture and were the most popular of the seven job activity areas represented on the MOPSA. Conversely, over two-thirds (68.6 percent) of the respondents preferred agricultural job activities in occupational areas other than "Production Agriculture".

Table 69.--Distribution of Tenth Grade Vocational Agriculture Students by Their Highest Interest Area Within Agriculture as Measured by the Michigan Occupational Preference Survey in Agriculture (MOPSA), 1974-75.

Rank Order	Agricultural Interest Area/ MOPSA Scale	Respondents by Highest Interest Area/MOPSA Scale	
		No.	%
1	Production Agriculture	44	31.4
2	Agricultural Mechanics	36	25.7
3	Wildlife	25½[a]	18.0
4	Ornamental Horticulture	14	10.0
5	Agribusiness	11	7.9
6	Forestry	7½[a]	6.0
7	Conservation	2	1.0
Total		140[b]	100.0

[a] Denote the shared value of a two-way tie.

[b] Representing four schools.

"Agricultural Mechanics" was the second most popular interest area, being selected by about one-fourth (25.7 percent) of the students. Nearly one-fifth (18.0 percent) of the respondents chose "Wildlife" activities, the third most popular selection; while only one-tenth (10.0 percent) of the students were most interested in "Ornamental Horticulture", the fourth ranked area. The least popular interest areas were "Agribusiness" (7.9 percent), "Forestry" (6.0 percent), and "Conservation" (1.0 percent), which ranked fifth, sixth, and seventh, respectively.

Basic Findings Restated

In summary, collective answers to four basic questions regarding the agricultural interests and aspirations of Michigan high school students were found, presented, and discussed in this chapter. The following statements provide a recap of the answers or findings which directly relate to those four basic questions (see p. 177):

1. Approximately 7.6 percent of all tenth graders had their highest vocational interest in "Agriculture".
2. More students (31.4 percent) were interested in "Production Agriculture" than in any other specific occupational area within the broad field of agriculture.
3. Approximately 6.9 percent of all tenth graders selected an agricultural program as their first vocational program choice.
4. About 1 student in 20, or 4.9 percent of all public school sophomores, selected "Agriculture" as their first occupational choice.

CHAPTER VI

RELATIONSHIPS BETWEEN MANPOWER NEEDS, PROGRAMS OF VOCATIONAL AGRICULTURE, AND STUDENT INTERESTS IN AGRICULTURE

Objective Question 3: What are the congruencies and discrepancies in existing vocational agribusiness and natural resources programs in terms of: (1) jobs available, programs of instruction available, and career patterns; and (2) competencies needed for job-entrance and competencies being developed in the present programs?

This chapter was designed to examine the relationships among the major findings of the previous chapters for the purpose of determining the congruencies and discrepancies between manpower needs, existing programs of vocational agriculture, and student interests and aspirations in agriculture. As such, Chapter VI, like the previous two, represents a portion of the program review component of the overall project (Part Three) and is a direct response to Part (1) of Objective Question 3 above.

Chapter VI also contains some general observations about the relationships between "competencies needed" and "competencies being developed", in partial response to Part (2) of Objective Question 3. However, as was noted in Chapter I, a shift in project priorities early in the study and a subsequent modification of project design reduced the comparability of the job competencies data. Consequently, specific data relating directly to Part (2) of Objective Question 3 were excluded from the tabular comparisons presented herein.

Objectives

The attainment of a total of three different sub-objectives was cited in the two previous chapters as the necessary precondition for responding to Objective Question 3, the primary objective of the program review component. Two of the three sub-objectives were the subject of Chapter IV, while a portion of the third sub-objective was the focus of Chapter V. The third sub-objective was assigned to this chapter as well. It was:

3. To determine the degree of congruency and discrepancy between the characteristics of the present vocational agriculture programs and the evidence of need based on manpower demand, required competencies,[1] and student interests/aspirations.

Methods

The basic procedure used in this chapter was to consolidate key data from the preceding chapters, arrange in tabular form, and identify congruencies and discrepancies. Student output projections were based on official enrollment figures supplied by the Michigan Department of Education. Manpower needs projections were derived from data in Chapter II and from employee turnover rates provided by the Michigan Employment Security Commission (MESC).

The major variables compared include student output (both actual and projected) by program area, projected manpower needs by occupational (program) area, theoretical output if enrolled by highest agricultural interest area, and percentage of instructor time compared with the preceding variables. The general findings regarding competencies needed are also presented.

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[1] Comparisons involving "competencies" were limited to general observations.

Findings

Estimated Program Output

The percentages of students enrolled by program area were calculated from the total statewide enrollment in vocational agriculture (grades 9 through 12) in 1973-74, as reported in Table 70. Over 84 percent of vocational agriculture students were enrolled in three of the seven current USOE program areas (agricultural co-op was excluded). The three areas included agricultural production, 58.7 percent; ornamental horticulture, 13.1 percent; and agricultural mechanics, 12.4 percent. Agricultural resources had the fourth largest enrollment with 8.4 percent. The program areas with the smallest percentages of total enrollment were agricultural supplies/services, forestry, and agricultural products with 3.5, 2.3, and 1.6 percent, respectively.

The above percentages were applied to the projected estimate of successful completions (see p. 154 and Glossary) of high school vocational agriculture programs in 1975, as explained and shown in Table 70. A total of 2,788 successful completions were projected for 1975. Of this total, 492 (17.6 percent) were expected to be non-graduates. Similar projections were made for 1977. Since the Class of 1977 was 1.6 percent smaller than the Class of 1975, corresponding reductions were made in the number of successful graduates projected for 1977. On the basis of class enrollment sizes at the time of the survey, 45 fewer successful graduates were projected for 1977 than for 1975.

Table 70.--Distribution of Projected Estimates of Successful Completions of High School Vocational Agriculture by Reimbursable Program Area for End of School Years 1975 and 1977.

USOE Program		Estimate of the Percentages of Students by Program Area	Projected Estimates of Successful Completions of High School Vocational Agriculture					
			1975[b]			1977[c]		
Code	Area	%[a]	Graduates	Non-Graduates	Total	Graduates	Non-Graduates	Total
01.01	Agricultural Production	58.7	1,348	289	1,637	1,326	284	1,610
01.02	Agricultural Supplies/Services	3.5	80	17	97	79	17	96
01.03	Agricultural Mechanics	12.4	285	61	346	280	60	340
01.04	Agricultural Products	1.6	37	8	45	36	8	44
01.05	Ornamental Horticulture	13.1	300	65	365	296	63	359
01.06	Agricultural Resources	8.4	193	41	234	190	41	231
01.07	Forestry	2.3	53	11	64	52	11	63
Total		100.0	2,296	492	2,788	2,259	484	2,743

NOTE: A "successful completion" was defined to refer to a student who has completed at least two semesters of vocational agriculture beyond the freshman year and has either graduated or left school without graduating. Successful completion implies the individual has acquired at least the minimum competencies needed for employment in a particular area of agriculture. Projected estimates of "successful completions" were made by multiplying the end of school year unduplicated enrollment in vocational agriculture (13,118 were projected for 1975) by the average successful completion rate (85 percent) and by dividing the result by four (the enrollment count covers grades 9 through 12). Additional information on projecting numbers of "successful completions" is presented on p. 154.

[a] Percentages of students by program area were calculated from the total enrollment in vocational agriculture in 1973-74, excluding those enrolled in the agricultural co-op program. The latter is no longer offered as a separate program area.

[b] During the five-year period 1970-1974, end of school year enrollments in vocational agriculture averaged 2.02 percent of total high school enrollments (grades 9-12). End of school enrollment in vocational agriculture for 1975 was estimated by multiplying the total 1974-75 enrollment of 649,418 (grades 9-12) by 2.02 percent.

[c] Since the total enrollment of the Class of 1977 was 1.6 percent smaller during its sophomore year than was the Class of 1975, the end of school year enrollment in vocational agriculture for 1977 was estimated at 1.6 percent below the 1975 projection.

Projected Manpower Needs Versus Estimated Program Output

The congruencies and discrepancies between projected estimates of agricultural manpower needs and vocational agriculture program output, by occupational/program area during the five-year period 1975-79, can be identified from Table 71. The information in Table 71 was consolidated from data presented previously in Table 13 (p. 42) and in Table 70. A review of the statewide enrollment figures for grades eight, nine, and ten for the Classes of 1975 through 1979 indicated that only slight variations (perhaps a decrease of up to one percent) could be expected in the size of public high school enrollments in Michigan over the next five years. Consequently, the estimated number of successful completions in vocational agriculture for 1975 was also used as the estimated average number of successful completions projected annually for each of the four succeeding years, as shown in Table 71. The manpower needs and program output data are compared and contrasted by program area in the sections that follow.

Agricultural Production.--The current full-time farm labor force in Michigan was estimated at 45,000. An analysis of farmer survey projections indicated that by 1979 the farm labor force will be at least at its present size and could possibly expand to 65,000 full-time farmers. If the median estimate of 55,000 is projected, over 1,500 farmer replacements will be needed on Michigan farms during the current year and during each of the next four years. An additional 2,000 full-time farm operators and workers will be needed each year to allow for the projected expansion of labor force. In total, the number of additional full-time and replacement farm operators and workers needed annually was expected to exceed 3,500. However, on the

Table 71.--Comparison of Projected Estimates of Successful Completions of High School Vocational Agriculture with Projected Manpower Needs in Selected Agricultural Occupations for 1975-1979.

USOE Program		Estimated Average No. of Successful Completions in Vo. Ag. per Year 1975-79		Numbers Needing a Knowledge and Skill of Agriculture			
Code	Area	Total	(Graduates)	Total Estimated Employment in 1974	Average Number of Additional Full-Time per Year 1975-79	Average Number of Replacements per Year 1975-79	Combined Total of Additional Full-Time and Replacements/Year 1975-79
01.01	Agricultural Production	1,637	(1,348)	45,000 (private & self-employed farm operators only)	2,000[b]	1,557[c]	3,557
01.02	Agricultural Supplies/Services	97	(80)	2,308[a]	No Data	80[c]	80[c]
01.03	Agricultural Mechanics	346	(285)	1,991 (blacksmiths excluded)	236	283	519
01.04	Agricultural Products	45	(37)	19,127[a]	No Data	662[c]	662[c]
01.05	Ornamental Horticulture	365	(300)	10,073 (retail florists excluded)	1,067	720	1,787
01.06	Agricultural Resources	234	(193)	284[a]	No Data	10[c]	10
01.07	Forestry	64	(53)	4,188[a]	No Data	145[c]	145
01.08	Agriculture, Other	-	-	8,026[d]	No Data	278[c]	278
Total		2,788	(2,296)	90,997	3,303	3,735	7,038

NOTE: See Table 70 for information about "successful completions" and "graduates" in vocational agriculture.

[a] Compiled from 1970 census data.

[b] Based on a projected labor force of 55,000 private and self-employed farm operators and workers by 1979.

[c] Based on the Michigan Employment Security Commission statewide average employee replacement rate of 3.46 percent per annum.

[d] Included Agricultural Production (other than private and self-employed farm operators) + blacksmiths + retail florists + Agriculture, Other; compiled from 1970 census data.

supply side, the average annual number of successful completions in agricultural production from Michigan high schools was estimated at only 1,637 (1,348 graduates), or less than one-half of the projected number of additional full-time and replacement farm operators and workers needed each year. This discrepancy between the estimated supply of, and projected needs for, trained manpower in an industry as basic as farming was considered to be a highly significant finding.

Agricultural Supplies/Services.--According to the U.S. census data there were 2,308 persons employed in agricultural supplies and services occupations in Michigan during 1970. No primary data were obtained in this study to determine the current size of the work force in this area or to estimate the average number of additional full-time employees needed each year. However, application of the MESC (Michigan Employment Security Commission) average replacement rate to the census total indicated that about 80 worker replacements would be needed each year to maintain the work force at its 1970 level. This figure was the same as the estimated number of graduates each year from high school vocational programs in the agricultural supplies and services. Since nearly 100 successful completions were estimated to be available in this area each year, it was assumed that the current supply of, and needs for, trained manpower in the agricultural supplies and services area was in balance.

Agricultural Mechanics.--Primary data from Michigan farm machinery and equipment dealers indicated that 1,991 of their employees utilized agricultural skills and knowledges in the performance of their work at the time of survey. Those same respondents also projected an expansion in their labor force to 3,171 by 1979. If this expansion were to occur, 236 additional full-time employees and 283 worker replacements--or a total of 519 additional and replacement workers--would be needed annually through 1979.

On the supply side and in contrast to the above projected needs, Michigan high schools were estimated to be preparing only about 346 successful completions (285 graduates) per year in their agricultural mechanics programs. Or, the estimated output of trained manpower in agricultural mechanics from high school programs of vocational agriculture was found to be one-third (33 percent) less than the annual needs projected by the farm machinery and equipment industry.

Agricultural Products.--A sharp contrast was found between the size of the agricultural products work force relative to other agricultural occupational areas in Michigan and the size of enrollment in high school agricultural products programs relative to other agricultural program areas. According to the U.S. census data there were 19,127 persons employed in the inspection, processing, or marketing of agricultural products or by-products in Michigan during 1970. This ranked agricultural products second only to agricultural production in total employment. In contrast, vocational programs in agricultural products had the lowest annual estimate of successful completions (45) of the seven USOE agricultural programs offered by Michigan high schools.

No primary data were collected in this study to determine the current size of the agricultural products work force. However, application of the MESC average replacement rate to the 1970 total suggested that over 650 worker replacements would be needed annually just to keep the work force at its census level. This figure was nearly fifteen times larger than the 45 successful completions (37 graduates) anticipated each year from high school agricultural products programs.

Ornamental Horticulture.--Projected data from the survey of employers in the ornamental (environmental) horticulture industry indicated that 10,073 of their employees used agricultural skills and knowledges in the conduct of their work. The interviewees projected a sharp expansion in their labor force to 15,410 by 1970. An increase of this dimension would require nearly 1,800 additional full-time and replacement workers per year or nearly five-times the estimated annual output of successful completions (365; 300 graduates) from high school programs in ornamental horticulture.

Since retail florists were excluded from the survey, the discrepancy between manpower needs and program output in ornamental horticulture was actually even greater than described above or presented in Table 71. According to the U.S. census data, retail florists accounted for nearly 23 percent of the ornamental horticulture work force in Michigan in 1970. If the businesses of the retail florists were to expand at the same rate as projected by the surveyed respondents, then the annual requirement for additional full-time and replacement retail florists would alone exceed the current estimated annual output of successful completions in ornamental horticulture.

Agricultural Resources.--A significant discrepancy was found between the annual manpower needs of the agricultural resources industries in Michigan and the estimated output of successful completions in this program area. Of the seven USOE program areas, agricultural resources was the only one with excessive manpower output relative to projected needs. According to the 1970 census data, there were only 284 persons employed in agricultural resources occupations. This total would require only 10 additional full-time and replacement workers per year if the MESC average employee replacement rate were applied. In contrast, the annual number of successful completions in high school programs in agricultural resources was estimated at 234 (193 graduates).

Forestry.--According to the census data there were 4,188 persons employed in the forestry industry in Michigan during 1970. Since no primary data were collected to determine the current size of the forestry work force, the 1970 work force size was assumed and the MESC average employee replacement rate was applied. On this basis, it was estimated that about 145 worker replacements would be needed each year just to maintain the work force at its 1970 level. This figure was more than twice the estimated annual output of successful completions (64; 53 graduates) from high school vocational programs in forestry.

Agriculture, Other.--This category contained 1970 census data on those occupational remnants that were excluded from the three program areas involved in the manpower needs assessment surveys of the project (Part One), plus a small group of agricultural specialists who were best categorized as "Agriculture, Other". The USOE program areas, occupational exclusions, and employment levels were: Agricultural Production (other than private and self-employed farm operators), 4,721; Agricultural Mechanics (private and self-employed blacksmiths), 57; Ornamental Horticulture (retail florists), 2,854; and Agriculture, Other (agricultural scientists, n.e.c.), 394.

Totaling 8,026, this category was included to complete the agricultural employment picture in Michigan relative to manpower needs and USOE program area output. A group of this size would need an estimated (MESC rate) 278 replacement workers each year to maintain its 1970 level. Since "Agriculture, Other" was not a program area of instruction in Michigan high schools, the manpower needs for this group would need to come from among the successful completions of the program areas previously discussed.

A Summary.--Significant discrepancies were found to exist between the projected annual manpower needs and the estimated output of successful completions in six of the seven USOE program areas. The projected manpower needs in five of the discrepant program areas exceeded their estimated successful completions. Of the six areas, only agricultural resources had a significant oversupply of estimated successful completions. Congruency between projected manpower needs and estimated program output was found only in the agricultural supplies and services program area. The combined total of projected annual manpower needs for all agricultural occupations (7,038) was two and one-half times larger than the estimated average annual total of successful completions from all Michigan high school programs of vocational agriculture combined (2,788).

Manpower Needs Versus Output By Highest Agricultural Interest Area

It was apparent from the previous section that significant discrepancies existed between both the proportions and numbers of estimated successful completions per program area when compared with projected manpower needs. Therefore, in this section, a new dimension was explored; namely, that of tying student interests to manpower needs.

Most of the findings reported herein were addressed to the following speculative question: What would happen if the numbers of estimated successful completions by program area in 1977 were based upon the percentages of highest agricultural interest areas as reported on the MOPSA by the same students two years earlier?

In order to answer the above question, data regarding MOPSA scales, program output, and manpower needs from the three previous tables were consolidated into one, as shown in Table 72. Those findings are compared and discussed below within each of the five MOPSA scale-associated program areas.

Production Agriculture.--The percentage of vocational agriculture students with their highest agricultural interest in "Production Agriculture" (31.4 percent) was only a little over one-half as great as the percentage that was estimated to be actually enrolled in agricultural production programs (58.7 percent). If those same students were actually enrolled at the present time by their highest agricultural interest area, then the estimated number of successful completions in 1977 would be only 861, or less than one-fourth of the projected annual manpower needs for Michigan farms.

Agribusiness.--The "Agribusiness" scale was equivalent to two USOE program areas--agricultural supplies/services and agricultural products--which were combined here for comparative purposes. The percentage of students with their highest MOPSA score in "Agribusiness" (7.9 percent) was one and one-half times the combined percentage that was estimated to be actually enrolled in the agricultural supplies/services and agricultural products programs (5.1 percent). If those same students were currently enrolled by their highest agricultural interest area, then the number of successful completions in the two program areas would approximate 217 in 1977. This amount would still be far short of meeting the projected manpower needs (742) for the two agribusiness areas during the same year.

Agricultural Mechanics.--Percentage-wise, over twice as many vocational agriculture students had their highest MOPSA score in "Agricultural Mechanics" (25.7 percent) than were estimated to be actually enrolled in agricultural mechanics programs (12.4 percent). However, if those same students were presently enrolled by their highest MOPSA scale score, the number of successful completions in agricultural mecahnics in 1977 would exceed the projected

Table 72.--Distribution of Projected Estimates of Successful Completions of High School Vocational Agriculture for 1977 *If* Program Areas Completed Were to Correspond with Highest Agricultural Interest Areas of MOPSA-Tested Students.

Highest Agricultural Interest Area/ MOPSA Scale	Corresponding USOE Program Area(s)	Percentages of Students by MOPSA Scale/ Interest Area	Estimates of Successful Completions in Vo. Ag. in 1977 if Projected by Interest Area		Projected Manpower Needs in Agriculture for 1977	
Production Agriculture	Agricultural Production	31.4	861		3,557	
Agribusiness	Agricultural Supplies/Services Agricultural Products	7.9	217		742	
Agricultural Mechanics	Agricultural Mechanics	25.7	705		519	
Ornamental Horticulture	Ornamental Horticulture	10.0	274		1,787	
Conservation	Agricultural Resources	1.0	27		10	
Wildlife	Agricultural Resources	18.0	494	686		155
Forestry	Forestry	6.0	165		145	
None	Agriculture, Other	0.0	-		278	
Total		100.0	2,743		7,038	

NOTE: MOPSA refers to the Michigan Occupational Preference Survey in Agriculture. See footnotes on Table 70 for definition of "successful completion" and description of projection methods.

[a] See Table 69.

[b] See Table 70.

[c] See Table 71.

annual manpower needs for the farm machinery and equipment industry in Michigan by nearly 36 percent (186).[2] This would be in sharp contrast to the 34 percent (179) shortfall for the same year projected from estimated current enrollments in agricultural mechanics.

Ornamental Horticulture.--Proportionately fewer vocational agriculture students had their highest MOPSA scale in "Ornamental Horticulture" (10.0 percent) than were estimated to be actually enrolled in ornamental horticulture programs (13.1 percent). If those same students were currently enrolled according to their highest MOPSA scale score, the number would represent only 15.3 percent (274) of the additional full-time and replacement workers that ornamental horticulture employers had projected they would need during 1977.

Conservation, Wildlife, and Forestry.--Both "Conservation" and "Wildlife" contained job activities that fit the agricultural resources program area. Also, some job activities that were found in the "Forestry" scale were also included in the "Conservation" scale. Because of these overlapping features, the three scales were consolidated for purposes of analysis and compared with the combined areas of agricultural resources and forestry.

The proportion of students with their highest agricultural interest area in "Conservation", "Wildlife", or "Forestry" (25.0 percent) was nearly two and one-half times larger than the proportion that was estimated to be actually enrolled in either agricultural resources or forestry programs (10.7 percent). If those same students were presently enrolled by their highest MOPSA scale score, then the estimated output of successful completions in agricultural resources and forestry would be nearly four and one-half times greater than the projected manpower needs in those two areas for 1977. Most of this projected oversupply was attributed to high student interest in "Wildlife" coupled with low projected manpower needs in agricultural resources, as shown in Table 72.

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[2] The MOPSA scale for "Agricultural Mechanics" also included job activities beyond those normally found in the farm machinery and equipment industry. Therefore, some of the students with their highest interest score in this scale may have been primarily interested in mechanical activities more closely associated with agricultural structures, soil and water management, or rural electrification than with farm machinery and equipment.

A Summary.--When the percentages of students by highest agricultural interest area were applied to the total number of estimated successful completions in 1977, significant discrepancies resulted between the projected annual manpower needs and the estimated output of successful completions in four of the five MOPSA scale-associated program areas. Program output on the basis of highest MOPSA scale scores in "Production Agriculture", "Agribusiness", and "Ornamental Horticulture" was estimated to be far below the projected manpower needs of their respective occupational areas for 1977; while the combined output for "Conservation", "Wildlife", and "Forestry" was estimated to be far above the combined needs in agricultural resources and forestry for the same year. On the same basis, "Agricultural Mechanics" output was estimated to be only slightly above the projected needs of the farm machinery and equipment industry for 1977.

Manpower Needs, Occupational Plans, and Potential Output by Interest Area

The findings have revealed thus far that a continuation of current estimated enrollments in vocational agriculture would be insufficient to meet the projected manpower needs of most occupational areas in agriculture during the late 1970s. However, it was suggested in Chapter V that many more students were occupationally interested in "Agriculture" than were currently enrolled in programs of vocational agriculture. Further support for this observation was the discovery (from Michigan Department of Education records) that only about 34 percent (181) of the 527 operating school districts in Michigan--with organized high school programs (grades 9-12)--offered instruction in reimbursed programs of vocational agriculture during school year 1974-75. Therefore, much of the discrepancy between the estimated output of successful completions in vocational agriculture and the projected manpower needs in agriculture was attributed to the fact that vocational agriculture programs were unavailable for most of the state's high school age population.

Further evidence of the unavailability of vocational agriculture and the discrepancy between enrollments and student occupational interest in agriculture came from statewide enrollment data. Only about two percent of the 649,418 public high school students (grades 9-12) were enrolled in vocational agriculture in Michigan during 1974-75; while, in sharp contrast, 4.9 percent of the 4,571 tenth graders who had completed the OVIS indicated "Agriculture" as their first choice of occupational plans.

With the above in mind, the 4.9 percent rate (Occupational Plans--"Agriculture" First Choice) was applied to the statewide enrollment of tenth graders in the Class of 1977 to estimate and project the potential number of successful completions that might have occurred in 1977 if they had been enrolled in vocational agriculture. The results of this hypothetical construct are presented in Table 73.

Although the data were projected to the entire population of tenth graders in the Class of 1977, the percentages of students by interest areas were based on the responses of 140 vocational agriculture students enrolled in four schools, none of which were metro-core. Consequently, the data were

Table 73.--Distribution of Projected Estimates of Successful Completions for 1977 If the Percentage of Michigan Tenth Graders with "Occupational Plans--'Agriculture' First Choice" Were Currently Enrolled in High School Programs of Vocational Agriculture on a Statewide Basis.

Highest Agricultural Interest Area/ MOPSA Scale	Corresponding USOE Program Area(s)	Percentages of Students by MOPSA Scale/ Interest Area	Projected Estimates of Successful Completions of High School Vo. Ag. in 1977 if 4.9 percent of the Current Tenth Graders were Enrolled in Vocational Agriculture[a]				Projected Manpower Needs in Agriculture for 1977[c]	
		%	Graduates	Non-Graduates	Total			
Production Agriculture	Agricultural Production	31.4	1,522	327	1,849		3,557	
Agribusiness	Agricultural Supplies/Services Agricultural Products	7.9	383	82	465		742	
Agricultural Mechanics	Agricultural Mechanics	25.7	1,246	267	1,513		519	
Ornamental Horticulture	Ornamental Horticulture	10.0	485	104	589		1,787	
Conservation	Agricultural Resources	1.0	48	10	58	1,471	10	155
Wildlife	Agricultural Resources	18.0	873	187	1,060			
Forestry	Forestry	6.0	291	62	353		145	
None	Agricultural, Other	0.0	-	-	-		278[c]	
Total		100.0	4,848	1,039	5,887[b]		7,038	

NOTE: MOPSA refers to the Michigan Occupational Preference Survey in Agriculture. See footnotes on Table 70 for definition of "successful completion".

[a] Approximately 4.9 percent of the 4,571 tenth graders who completed the Ohio Vocational Interest Survey (OVIS) indicated that "Agriculture" was their "Occupational Plans--First Choice". This percentage was applied to the total projected grade 12 enrollment for all Michigan public high schools in spring 1977.

[b] The average drop in class enrollment from grade 10 to grade 12 for Michigan public high schools was 18.6 percent for the five-year period 1971-75. Assuming a constant rate of decrease in enrollment during the two-year period, total grade 12 enrollment for 1977 was projected by reducing the grade 10 enrollment of 173,641 for 1975 by 18.6 percent. The projected grade 12 enrollment was, in turn, multiplied by 4.9 percent to obtain the hypothetical number of students in the Class of 1977 who would be enrolled in vocational agriculture if "Occupational Plans--'Agriculture' First Choice" were the sole criterion for enrollment. The product of 6,926 vocational agriculture students was reduced to 5,887 (85 percent) to represent the theoretical number of successful completions in vocational agriculture.

[c] See Table 71.

considered to be representative of the agricultural preferences of vocational agriculture students throughout the state, but were not necessarily reflective of the agricultural preferences of those students--the 98 percent--who were not enrolled in vocational agriculture, many of whom attended metro-core schools. However, despite this limitation, the data presented in Table 73 and discussed below by MOPSA scale/program area provide some insight into the agricultural preferences and manpower potentials of Michigan high school students.

Production Agriculture.--On the basis of the percentage of students interested in Production Agriculture and the percentage indicating "Agriculture" as their first choice of occupational plans, the statewide potential output in agricultural production in 1977 would have been 1,849, or 52 percent of the projected manpower needs in farming for the same year.

Agribusiness.--Similar shortfalls were projected for the combined program areas of agricultural supplies/services and agricultural products for 1977. On the basis of highest interest in Agribusiness, and "Agriculture" as first choice of occupational plans, the statewide potential output for the two areas would have been 465, or nearly 63 percent of projected manpower needs for 1977.

Agricultural Mechanics.--In sharp contrast to the previous two, a large oversupply of agricultural mechanics would have resulted in 1977 if the percentage of tenth graders with highest MOPSA scores in "Agricultural Mechanics" were currently enrolled in comprehensive, adequately equipped (most were not in 1974) agricultural mechanics programs. Given this assumption, the potential number of successful completions would have exceeded 1,500, or nearly 300 percent of projected needs on a statewide basis.

Ornamental Horticulture.--A relatively small percentage of tenth graders (10 percent) had their highest agricultural interest score in "Ornamental

Horticulture" even though two of the schools included in the MOPSA sample offered instruction in ornamental horticulture, one exclusively. As a result, the statewide potential output in ornamental horticulture in 1977 would likely not have exceeded 600, or not more than one-third of the projected manpower needs (1,787) in ornamental horticulture for 1977.

Conservation, Wildlife, and Forestry.--A great deal more occupational interest in "Convervation", "Wildlife", and "Forestry"--the three related MOPSA scales--was present among tenth graders than there were projected manpower needs in agricultural resources and forestry for 1977. According to the percentage of students with one of the three related MOPSA scales as their first choice of occupational plans, the statewide potential output in the two occupational areas could well have exceeded 1,400, or nine times the projected manpower needs (155) in the two areas for 1977.

A Summary.--Discrepancies were found between the projected manpower needs in agriculture for 1977 and the potential number of successful completions that might have resulted if those tenth graders with "Occupational Plans--'Agriculture' First Choice" were enrolled in programs of vocational agriculture (appropriate to their MOPSA scale). The state's potential, among the Class of 1977, for meeting its manpower needs in the areas of agricultural production, agricultural supplies/services and agricultural products, and ornamental horticulture appeared to be significantly weak. On the other hand, the state's potential for meeting its needs in agricultural mechanics, agricultural resources, and forestry would be very strong *if those students who were occupationally interested in "Agriculture" were enrolled in the appropriate instructional programs, statewide*. The overall potential output or combined total of successful completions in 1977 was projected at 5,887, or less than 84 percent of the total projected manpower needs in agriculture for the target year, as shown in Table 73.

Avocational Interest in Agriculture

The projected agricultural manpower needs for Michigan during the late 1970s were found to exceed not only the current estimated enrollments in vocational agriculture, but the theoretical potential for successful completions based on student occupational interest and statewide accessibility to instruction in vocational agriculture as well. As a result, Michigan agriculture may have to draw more heavily upon a third stratum of agriculturally interested students, namely those with "avocational" interests in agriculture, in order to meet its projected manpower needs.

In Chapter V, it was observed that students with their first choice of occupational plans in "Agriculture" accounted for only two-thirds of those who had their highest OVIS scale score in "Agriculture". It was also suggested that the one-third who had their highest interest scale score in "Agriculture" were primarily interested in "Agriculture" for avocational rather than for vocational purposes.

According to the OVIS data presented in Table 68, 7.6 percent of the total sample had "Agriculture" as their highest interest scale score while only 4.9 percent indicated "Agriculture" as their first choice of occupational plans. If the above assumption about the difference between the two OVIS categories is correct, then 2.7 percent of the OVIS respondents were primarily interested in "Agriculture" for avocational purposes.

The projected, statewide, grade 12 enrollment for the Class of 1977 was estimated at 141,344 students (see Table 73 footnotes). Application of the 2.7 percent "avocational rate" to the estimated grade 12 enrollment indicated that as many as 3,816 students, on a statewide basis, may have had an avocational interest in "Agriculture" at the time of survey. If this additional quantity of students were enrolled in vocational agriculture programs, approximately 85 percent would be expected to be successful completions. Theoretically, this would have added another 3,244 successful completions to the total output (5,887) shown in Table 73. This sum would have been more than enough to meet the projected manpower needs in Michigan for 1977.

Manpower Needs, Program Output, Student Interests, and Instructor Time Compared

Various groups of job competencies were inherent in the vocational makeup of the seven USOE program areas, whether in reference to program output (competencies taught) or manpower needs (competencies needed). For example, one would normally expect general agreement between a teacher of agricultural mechanics and a farm machinery dealer that the ability to use various types of hand and power tools (a competency group) was closely associated with the area of agricultural mechanics. With this in mind, a comparative review of of selected program area variables--such as actual enrollment, number of schools offering the program, and teacher instructional time involved--was conducted to provide general information about the extent to which various groups of job competencies (implicit in the program areas themselves) were being taught. Those data were compiled by program area, as shown in Table 74, and are discussed in the sections below.

Agricultural Production.--A relatively high degree of congruency was found between the percentages of enrollments in, teacher instructional time devoted to, and manpower needs in agricultural production relative to other areas. The relatively high percentage of schools offering agricultural production and high student interest in the area were consistent and probably mutually reinforcing.

Agricultural Supplies/Services.--Although based on census data, the percentage of projected manpower needs was relatively small in comparison to the percentage of schools offering instruction in the area. Student interest and teacher instructional time were proportionately greater than were enrollments in agricultural supplies/services. However, in light of the projected needs for manpower with agribusiness competencies in the agricultural products area, the percentage of instructor time devoted to agricultural supplies/services may actually have been too little.

Agricultural Mechanics.--The percentage of teacher time devoted to agricultural mechanics was proportionately greater than were the percentages of projected annual manpower needs and annual enrollments in the area; however, it was proportionally less than the percentage of student interest in the area. Again, the relatively high student interest in this area and number of schools offering instruction in agricultural mechanics were consistent and most likely mutually reinforcing.

Ornamental Horticulture.--Sharp discrepancies were observed between the variables in ornamental horticulture. The proportion of vocational agriculture schools offering instruction in this area was greater than the proportion of projected manpower needs in the same area. However, the latter was

Table 74.--Distribution of Percentages to Compare Student Interests, Actual Enrollments, School Offerings, Teacher Time, and Manpower Needs by Program Area.

USOE Program			Percentages by Program Area				
Code	Area	Corresponding Highest Agricultural Interest Area/ MOPSA Scale	Students by MOPSA Scale/ Interest Area	Estimated Actual Enrollment by Program Area	Vo. Ag. Schools Offering Instruction in Program Area	Approximate Teacher Instructional Time Devoted to Area	Projected Annual Manpower Needs in Agriculture
01.01	Agricultural Production	Production Agriculture	31.4	58.7	81.8	53.9	52.6
01.02	Agricultural Supplies/ Services	Agribusiness	7.9	3.5	9.9	2.2	1.2
01.03	Agricultural Mechanics	Agricultural Mechanics	25.7	12.4	43.1	16.2	7.7
0 .04	Agricultural Products	(See Agribusiness)	-	1.6	6.6	0.3	9.8
01.05	Ornamental Horticulture	Ornamental Horticulture	10.0	13.1	35.6	20.0	26.4
01.06	Agricultural Resources	Conservation Wildlife	1.0 18.0	8.4	19.3	5.5	0.1
01.07	Forestry	Forestry	6.0	2.3	8.8	1.9	2.2
	Total		100.0	100.0	-	100.0	100.0

NOTE: Percentages were compiled from data in Tables 31, 69, and 71.

significantly greater than the proportion of teacher instructional time devoted to ornamental horticulture. In other words, job competencies in ornamental horticulture were taught to a lesser extent relative to job market needs than were any other group of competencies except for those in agricultural products.

The percentage of projected manpower needs in ornamental horticulture was proportionately twice as large as the percentage of students enrolled in the area, while the percentage of teacher instructional time devoted to the area was double the percentage of students with their highest MOPSA scale score in ornamental horticulture.

Agricultural Resources.--A high degree of congruency was found between the percentage of students with their highest agricultural interest in agricultural resources and the percentage of vocational agriculture schools offering instruction in the same area. Both percentages were significantly greater than the percentages of actual enrollments and approximate teacher instructional time devoted to the area. However, the percentage of annual manpower needs in the area of agricultural resources was significantly below those of both actual enrollments and teacher instructional time.

Forestry.--The percentage of vocational agriculture schools offering forestry was proportionally greater than the percentage of students with their highest agricultural interest in the same area. Both percentages were significantly greater than the percentages of actual enrollments, teacher instructional time, and projected manpower needs, all three of which were congruent.

Competencies Needed and Competencies Being Developed

The nature of the study and its subsequent design precluded detailed analyses of possible congruencies and discrepancies between competencies required for job entrance (as perceived by relevant job holders) and competencies being developed in programs of vocational agriculture. Rather than dwell on the detailed similarities and differences between "what was being taught" and "what was needed to get a job", it was decided early in the study to instead use the competency-based education model and concentrate on identifying those competencies that were needed by high school graduates for entry level employment into occupations within one of four agricultural clusters--Agricultural Production, Environmental Horticulture, Farm Implement Repair, and Biological-Technical Services in Agriculture--as reported in Chapter II.

Several hundred skills and knowledges were identified and validated as needed by entry level workers for employment in occupations within the four clusters as discussed earlier. Those findings were presented in narrative form in Chapter II; the tabular data upon which they were based were printed under separate title.[3]

A few general observations were made while examining the relationships between "competencies needed" and "competencies being developed". Those findings are discussed in the remaining paragraphs.

The job competencies reported by farmers and by workers in the Environmental Horticulture and Farm Implement Repair industries, as being required for employment in their occupations,[4] were found to correspond in general with those reported as presently being developed in high school programs of vocational agriculture (see Tables 44-47, 49, and 51-56). In addition, the job titles of the task analysis respondents in the Agricultural Production, Environmental Horticulture, and Farm Implement Repair occupational clusters (see Appendix F, Tables F-1, F-2, and F-3) were similar to those identified by vocational agriculture teachers as job titles for which students were trained at the eleventh and twelfth grade level in local programs of vocational agriculture (see Table 43).

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[3] See p. 60.

[4] See Table Series B (S-5 through S-11) in the Tabular Supplement.

According to the 1970 Census of Population, nearly 3,500 persons were employed at the time of survey in the Biological-Technical Services in Agriculture. This occupational cluster accounted for only 3.8 percent of the state's agricultural labor force and its job titles were exceedingly diverse.[5] Few of task analysis respondent job titles in the Biological-Technical Services in Agriculture were identified by teachers of vocational agriculture as job titles for which their students were currently being prepared (see Table 43). Accordingly, few of the competencies reported by workers in this occupational cluster as needed for employment in their industries corresponded with those competencies being developed in high school programs of vocational agriculture.

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[5] See Appendix F, Table F-4.

CHAPTER VII

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of the research reported was (1) to assess the agricultural manpower needs in Michigan from employers in terms of present jobs available and jobs projected over the next five years, (2) to identify and validate competencies needed for agricultural job entry upon graduation from high school, and (3) to determine the degree of congruency and discrepancy between the characteristics of the present programs of vocational agriculture and the evidence of need based on manpower needs, required competencies, and student interests and aspirations in agriculture. This information was sought by the Michigan Department of Education, Vocational-Technical Education Service, to facilitate planning and policy formulation relative to vocational education in agriculture in Michigan and to provide the necessary data base for the qualitative and quantitative expansion of high school programs of vocational agriculture throughout the state.

In order to fulfill the stated objectives, the study was designed around three major activities: (1) a manpower needs assessment survey of three major occupational areas; (2) the identification and validation of several hundred competencies by analyses of job tasks in four occupational areas; and (3) an in-depth review of all ongoing programs of vocational agriculture in Michigan, including an assessment of the agricultural interests and aspirations of high school tenth graders. Included in the study were four of the major occupational clusters in the Michigan agricultural work force--Agricultural Production (farming), Environmental Horticulture, Farm Implement Repair, and the Biological-Technical Services in Agriculture. The four were identified from 1969 and 1970 census data.

Manpower data were obtained via structured telephonic interviews with 144 farm operators, 100 environmental horticulture entrepreneurs, and 50 farm equipment dealers. The farms of the farmer-interviewers were located in counties which ranked first in the state in the production of selected crops and/or livestock and were selected as being most representative of a cross section of farms of that type in that county. The environmental horticulture and farm equipment dealers were randomly selected from the total memberships of their respective state occupational associations. Manpower needs for the Biological-Technical Services in Agriculture and other occupational areas in agriculture were estimated from secondary data sources.

The job task analysis process involved the compilation of task (skill and knowledge) inventories in each of the four major occupational areas and their validation by workers in the appropriate industries/occupational areas. A total of 112 respondents (representing 21 different industries) were asked to indicate: (1) if the item represented an entry level skill or knowledge; and (2) the relative importance of each item for beginning workers. Job skills were "accepted" if 40 percent or more of the respondents answered in the affirmative; otherwise, the skills were marked "review". The latter were considered unnecessary to include in high school level programs designed to prepare students for employment in the occupation. Job knowledges were evaluated in a similar manner, except the minimum acceptance level was lowered to 33 percent. Accepted job tasks within an occupational cluster which were common to all surveyed industries were identified as were those which were industry specific.

Data regarding the characteristics of the 181 reimbursed programs of vocational agriculture in Michigan during 1973-74 were obtained through a variety of survey techniques and from several sources. The schools involved provided information about their vocational agriculture program components, curricula, objectives, facilities, teacher assignments, student selection criteria, and other related items. Michigan Department of Education records were the source of student enrollments by vocational agriculture program area, occupational experience data, and related information. Both follow-through and follow-up studies were completed on former vocational agriculture students from the Class of 1973, in six selected schools, to analyze student occupational training and employment patterns.

Student vocational interests and aspirations in agriculture were assessed in two surveys. First, the Michigan Occupational Preference Survey in Agriculture (MOPSA) was administered to 140 tenth grade vocational agriculture students, in four selected schools, to identify the group(s) of agricultural occupations in which the students were most interested. In a second survey, the Ohio Vocational Interest Survey (OVIS) was used to measure the vocational interests and aspirations of 4,571 tenth graders in 12 schools (4 offering tenth grade agriculture, 8 not).

Contingency tables were computed and tabular comparisons were made between the manpower, program review, and student interest variables. However, detailed comparisons between the competencies needed and the above variables were limited by design. Congruencies and discrepancies between both actual and projected data were identified and discussed.

Selected Major Findings: A Recap

Manpower Needs

Agricultural Production.--There were approximately 45,000 private and self-employed operators and workers employed full-time on Michigan farms during fall 1974. Farmers accounted for about one-half of the state's agricultural work force. The total number of farms in Michigan has not changed appreciably since 1973. Projections based on primary data indicated the full-time labor force will be at least at its present size in 1979 and could rise to 65,000. A projected mean of 55,000 was used for manpower planning purposes.

Environmental Horticulture.--Although retail florists were excluded from the 1974 survey, employers in Environmental Horticulture occupations in Michigan felt that 10,073 of their employees required agricultural competencies. Projections from employer estimates indicated they would need a total work force of 15,410 employees with agricultural competencies by 1979, or a 53 percent increase in the present work force size.

Farm Implement Repair.--Projected data from farm machinery dealers indicated that 1,991 of their employers required agricultural competencies to perform their work in 1974. Projections based on dealer estimates suggested they would need a total agricultural work force of 3,171 by 1979. This represented a 59 percent expansion in the current work force size.

The Biological-Technical Services in Agriculture.--Since no primary data were available, the best estimate of work force size in this cluster in

1974 came from 1970 census data. The work force was estimated at 3,478. Without primary data it was impossible to determine the number of new jobs that might be available each year due to work force expansion.

Unsurveyed Occupations by Program Area.--According to the 1970 census data, the total agricultural employment in Michigan (for areas not surveyed in 1974) by U.S. Office of Education program area was as follows: agricultural supplies/services, 2,308; agricultural products, 19,127; agricultural resources, 284; forestry, 4,188; and "other" agriculture, 8,026. "Other" agriculture included some agriculture production, agriculture mechanics, and ornamental horticulture worker categories that were excluded from the 1974 survey.

Total Agricultural Work Force.--When census and primary data were combined, it was estimated that nearly 91,000 Michigan workers needed agricultural competencies in the performance of their employment in 1974. A combination of 1970 census data and manpower needs projected by employers in 1974 indicated that total agricultural manpower needs in Michigan will exceed 107,500 by 1979. To achieve this level, an average of 7,038 new workers with agricultural competencies will be needed annually to replace those who separate from the labor force and to fill the jobs created by an expanding agricultural industry.

Level of Formal Education Required.--Of the farmers surveyed, 46 percent indicated formal education beyond high school would be required of their operator replacements while 44 percent felt a high school level of education would be adequate. Those same minimum levels were required by 21 and 37 percent, respectively, of the respondents in regard to their full-time employee replacements.

Forty-four percent of the environmental horticulture respondents reported high school was the minimum educational level required for their beginning employees while 27 percent required a minimum level beyond high school. In the case of the farm equipment industry, 61 percent of the respondents indicated their beginning employees needed to have at least a high school education while 31 percent required education beyond high school.

Competencies Needed

Analyses of job tasks resulted in the identification and validation of several hundred skills and knowledges as being needed by entry level workers for employment in occupations within the four clusters studied. Considerable variation was found in the degree of specialization of workers among the four clusters.

A review of the "accepted" skills and knowledges indicated a high degree of discrimination on the part of the respondents. Within an occupational cluster there was evidence of a high degree of commonality of skills and knowledges together with a distinct need for specialization as preparation for work in a specific industry.

When respondents indicated an "accepted" skill, they usually also "accepted" the associated knowledges. However, there were areas where skills were "accepted" and many associated knowledges were marked for "review". Some skills and knowledges were "rejected" (marked for "review") by workers in specific industries within an occupational cluster because either they did not apply to the specific industry or were too sophisticated for entry level workers.

In the case of the Biological-Technical Services in Agriculture, the interviewers found few respondents with the occupational title of "technician" even though food processing plants, canneries, wineries, veterinary clinics, and related firms were contacted.

School Program Characteristics

Availability of Instruction in Vocational Agriculture.--Approximately 34 percent (181) of the 527 operating public school districts in Michigan (with organized senior high school programs in 1974-75) offered instruction in vocational agriculture in at least one of seven reimbursable program areas. Nearly 80 of the schools offering vocational agriculture were located in the lower one-half of the Lower Peninsula exclusive of the Detroit metropolitan area. The availability of program area offerings among the 181 schools ranged from 83 percent for agricultural production to less than 7 percent for agricultural products.

Enrollments in Vocational Agriculture.--Only two percent (13,125) of the approximately 650,000 students who attended Michigan high schools (grades 9-12) in 1973-74 were enrolled in reimbursed programs of instruction in vocational agriculture. Of the seven current USOE program areas (agricultural co-op excluded), agricultural production had the largest enrollments (58.7 percent) and agricultural products (1.6 percent) the smallest. Ornamental horticulture and agricultural mechanics had similar enrollments and when combined accounted for about one-fourth of the students enrolled in vocational arriculture. The average enrollment collectively for all program areas of vocational agriculture was slightly over 100 enrollees per school.

Program Components.--Only 9 percent of the 133 vocational agriculture schools that responded to the survey included seventh and eighth grade career exploration classes in agriculture. Instruction in vocational agriculture was offered at the ninth, tenth, eleventh, and twelfth grade levels by 88, 93, 95, and 96 percent, respectively, of the responding schools. FFA chapters were included in the instructional program in about 87 percent of the schools.

Student Selection Criteria.--More than one-half (53.4 percent) of the 133 responding schools reported the use of no specific selection criterion in admitting students into programs of vocational agriculture.

Use of Teaching Day.--Teachers in local programs of vocational agriculture used about two-thirds of the teaching day for classroom activities in vocational agriculture during 1973-74. Farm visits, planning, other vocational instruction, and supervisory activities filled the balance of the teaching day.

Program Area Laboratory (Shop) Space.--Agricultural production was the only program area offered which had a substantial number of schools (in this case 69 percent) with laboratory space other than land designated specifically for instruction in that area. Only 40 percent of the schools with agricultural mechanics programs and 37 percent of those with ornamental horticulture programs had laboratory space designated specifically for instruction in those areas. Other program areas had little or no designated laboratory space.

Types of Programs.--Although the delivery system for vocational agriculture in Michigan includes local programs, shared-time programs, and area center programs, more than 91 percent of the programs in 1973-74 operated primarily from facilities in the local education agencies.

Successful Completions.--Results of an in-depth analysis of the training patterns of 194 students in the Class of 1973, who took vocational agriculture, indicated that about 85 percent completed at least two semesters of vocational agriculture beyond the ninth grade. The latter were deemed "successful completions". Of the 85 percent, approximately 70 percent graduated while the remaining 15 percent did not.

Student Interests and Aspirations in Agriculture

Highest OVIS Scale Score in "Agriculture".--"Agriculture", one of 24 interest inventory scale scores on the Ohio Vocational Interest Survey (OVIS), was ranked first by 7.6 percent of 4,441 tenth graders surveyed in twelve Michigan high schools during 1974-75. Most of the respondents were students in city or metro-core schools. In the four schools which offered tenth grade vocational agriculture, 10.4 percent of the sophomores selected "Agriculture" as their highest job activity or vocational interest area as compared with only 6.4 percent of the tenth graders in the eight schools not offering vocational agriculture at this grade level. Approximately 4.6 percent of the metro-core school respondents had their highest OVIS scale score in "Agriculture".

About one-fourth of the tenth grade vocational agriculture students in the survey had low job activity or vocational interest in "Agriculture" relative to other OVIS scales.

Geographical location and community type appeared to be greater predictors of the percentage of students expected to have high vocational interest in agriculture than whether or not a school offered instruction in vocational agriculture.

Agricultural Program First Vocational Program Choice.--Of the 4,571 tenth graders who completed the OVIS, 6.9 percent selected an agricultural area as their vocational program first choice. Agricultural programs were the vocational program first choices of only 38.2 percent of the tenth graders enrolled in vocational agriculture.

First Choice Occupational Plans in "Agriculture".--One out of every 20, or 4.9 percent of the 4,571 tenth graders who completed the OVIS selected "Agriculture" as their first choice of occupational plans. However, only 42.7 percent of the tenth graders in the vocational agriculture sample had their first or second occupational choices in "Agriculture".

About one-third of the tenth graders in the sample who had their highest interest scale score in "Agriculture" appeared to be primarily interested in "Agriculture" for avocational rather than for vocational purposes.

Vocational Agriculture Student Interest Within Agriculture.--Nearly one-third (31.4 percent) of the 140 tenth grade vocational agriculture students who completed the Michigan Occupational Preference Survey in Agriculture (MOPSA) had their highest agricultural job activity interest in "Production Agriculture". Conversely, over two-thirds (68.6 percent) of the sampled students preferred agricultural job activities in one of six occupational areas other than "Production Agriculture".

Relationships Between Some Components of the Study

Anticipated Program Output in 1977.--On the basis of class enrollment sizes at the time of the survey, a total of 2,743 successful completions from high school programs of vocational agriculture in Michigan were projected for 1977.

Projected Manpower Needs Versus Expected Program Output.--Significant discrepancies existed between the projected annual manpower needs for the next four years and the expected output of successful completions in six of the seven U.S. Office of Education program areas. The projected annual manpower needs exceeded their estimated supply of successful completions in five areas: agricultural production (by 2.2 times); agricultural mechanics (1.5x); agricultural products (14.7x); ornamental horticulture (4.9x); and forestry (2.3x). Agricultural resources was the only area that appeared to have a significant oversupply (23.4x) of trained manpower projected. Congruency between projected manpower needs and expected program output was found only in the agricultural supplies and services program area.

The combined total of projected annual manpower needs for all agricultural occupations until 1980 was 7,038. This total was two and one-half times larger than the projected average annual output of successful completions from all Michigan high school programs of vocational agriculture combined.

Manpower Needs, Occupational Plans, and Potential Output by Interest Area.--The projected agricultural manpower needs for Michigan during the late 1970s were found to exceed not only the current estimated enrollments in vocational agriculture, but the theoretical potential for successful completions based on student occupational interest and statewide accessibility to instruction in vocational agriculture as well.

Avocational Interest in Agriculture.--If student avocational interest were included in the formula for projecting the hypothetical number of potential successful completions in vocational agriculture for a given year, then the projected agricultural manpower needs for Michigan in 1977 could theoretically be met on a composite basis by the Class of 1977.

Conclusions

Subject to the conditions and limitations of this study, the following conclusions appear warranted:

1. Michigan farms will need more than twice as many additional full-time and replacement operators and workers, over the next four years, than are currently being prepared in high school programs of vocational agriculture. If Michigan high schools are to meet the projected farm manpower needs for the late 1970s, then current vocational program enrollments in agricultural production will need to at least double.
2. Current vocational program enrollments in agricultural mechanics will need to increase by at least 30 percent per year if they are to fill the trained manpower needs forecasted by Michigan farm machinery and equipment dealers for their industry through 1979.
3. Although agricultural products has the second largest agricultural work force in Michigan, no survey of this area was included in the study. However, on the basis of an analysis of 1970 census data, it was concluded that vocational program enrollments in agricultural products will need to increase nearly 15 times over their present levels if high schools are to provide enough full-time replacements to even maintain the agricultural products work force at its 1970 size.
4. A five- to six-fold expansion of current enrollments in high school ornamental horticulture programs will be needed if those programs are to meet the projected manpower needs of the Michigan environmental horticulture industry between now and 1980.
5. If high schools in Michigan are to deliver the trained agricultural manpower which has been identified and projected in this study, then overall enrollments in vocational agriculture will need to more than double during the next four years.

6. Although most employers in the farming, environmental horticulture, and farm equipment industries in Michigan would require their prospective employees or replacement operators to have at least a high school level of education, a large minority would also require completion of some formal education beyond the secondary level.
7. The degree of discrimination by workers in the occupations included in this study indicates that the methods and procedures used were basically sound and that similar task analysis processes would be helpful in developing instructional programs in other areas. However, reference is made to page 66, footnote 8, which indicates that behaviors (affective factors) as well as skills and knowledges be included in subsequent inventories.
8. By using the lists of validated skills and associated knowledges that were compiled in this study, it is possible to establish standards of performance through the preparation of performance objectives and to measure the degree of proficiency of each individual student in terms of those standards.
9. Providing facilities for a training program that will enable each student to actually become proficient in each of the many "accepted" competencies listed for his/her occupation presents a challenging program to most local schools, since most have very limited instructional laboratory facilities.
10. Ways need to be devised to offer vocational programs which will include commonalities within an occupational cluster plus the vocational education needed for specialization in the industry for which the student is preparing.

11. Teachers who use performance objectives and instructional modules based on the task analysis findings of this study must have a clear understanding of the origin of the objectives and the outcomes to be required of students. Student teaching centers providing teacher education of this kind will need to be very carefully selected and the training program adequately supervised.
12. The successful implementation of competency-based instructional programs in agriculture at the senior secondary level will require the support of a well organized program of in-service teacher education.
13. On the basis of geographical distribution and program availability, the present programs of vocational agriculture in Michigan are insufficient to meet needs either in terms of employment opportunities or student interest areas in agriculture.
14. The introduction of career awareness and exploration programs in agriculture at the K-8 grade levels and the improvement of high school vocational guidance programs would likely strengthen both the career development and agricultural education programs of most Michigan public schools This conclusion was based upon the findings relative to student selection criteria for admission to vocational agriculture, the few schools offering any kind of instruction in agriculture, and the results of the Ohio Vocational Interest Survey.
15. The laboratory facilities used by most agricultural program areas in Michigan high schools were considered to be below optimum instructional standards. This deficiency was especially significant

in the areas of agricultural mechanics and ornamental horticulture because of the large numbers of schools and students involved.

16. Teachers of vocational agriculture in Michigan spend most of their teaching day engaged in classroom activities in agriculture.
17. A much larger proportion of the high school age population in Michigan has a strong interest in agriculture than is reflected in the statewide enrollment in vocational agriculture. This applies to metro-core as well as to rural areas.
18. The first choice occupational plans of most sophomore students enrolled in vocational agriculture are in areas other than "Agriculture".
19. Instruction in agricultural production will continue to be the most important vocational agriculture program area offered by Michigan high schools during the late 1970s.
20. Based on the current enrollments in programs of vocational agriculture, Michigan high schools will be unable to fully meet the state's trained manpower needs in agriculture before 1980.

Recommendations

It is an impossible task to enumerate all of the recommendations and implications which may be drawn from the results of a study of this scope. However, selected recommendations which may have a significant impact on vocational agriculture program planning and policy formulation at state and local levels are presented.

In accordance with the conclusions which have been drawn, the following selected recommendations are proposed:

1. Increased emphasis should be placed on agricultural production and ornamental horticulture--and to a lesser extent, agricultural mechanics (in relation to agricultural production and ornamental horticulture)--as major instructional areas in high school vocational agriculture programs in Michigan.
2. The agricultural products instructional program area should receive much more attention in preparing students for employment.
3. The network of vocational agriculture program offerings in Michigan should be expanded both geographically and programmatically to meet the state's existing and projected agricultural manpower needs.
4. Vocational program conferences involving high school, post-secondary, and university personnel should be conducted in an effort to develop an articulated occupational education program in agriculture for Michigan.
5. State approval for reimbursement of instructional programs should be contingent on the applicant school first having met certain minimum standards relative to curriculum, facilities, equipment, and professional staffing.
6. Increased emphasis should be placed on the use of cooperative vocational education methods in agriculture. Cooperative methods will make better use of community facilities, especially in those schools where instructional laboratory facilities are limited.

7. The expansion of instructional programs in vocational agriculture at area centers should be encouraged. Greater reliance upon area centers should result in improved efficiencies in the use of instructional facilities and equipment, a greater range of program area offerings, and better accessibility to agricultural programs for an increased number of students. Area centers however cannot assumed the whole burden for agricultural education. Local schools must provide the career exploration and/or "pre-vocational" instruction in agriculture.
8. Michigan high schools should offer systematic programs of instruction in vocational agriculture that will provide students with adequate job preparation upon completion of planned learning experiences. These programs should admit only those students who, after having completed "pre-vocational" programs in agriculture, have definite plans for occupational employment in agriculture.
9. Educational policies should be established to provide vocational preparation which is broad enough to cover the job activities of entrepreneurs and employees even though the actual range of such activities is broader than implied by occupational titles found in the _1970 Census of Population Classified Index of Industries and Occupations_ or in _Employment in Agricultural and Agribusiness Occupations_.
10. Additional studies should be conducted to determine the educational level at which competencies required in various occupations and/or job titles should be taught.

11. Skills and knowledges which were "rejected" in this study should be examined by educators and evaluated by workers in terms of their value for advancement up the career ladder. Although "rejected" for entry level, many of those skills and knowledges may be found important for promotion.

12. Since, skill and knowledge training cannot be completely effective without appropriate and effective behavioral performance. Studies should be encouraged to identify attitudes and behaviors that directly relate to vocational success.

13. Projects should be undertaken to use the lists of validated skills and associated knowledges to prepare performance objectives, modules, and instructional materials.

14. All public school systems in Michigan should introduce comprehensive career awareness and exploration programs in agriculture at the K-8 grade levels. Guidance and counseling services, of course, need to be an integral part of such "pre-vocational" programs to communicate the interests (vocational and avocational) of students to curriculum planners and to help insure sound occupational choices on the part of those students.

15. The Michigan Department of Education should actively expand its agricultural education services to all public educational institutions in the state, not just to those senior high schools with on-going programs of vocational education in agriculture. Much greater attention needs to be given toward assisting elementary and junior high schools and post-secondary institutions to develop relevant

educational programs in agriculture--be they exploratory, vocational, general, or avocational in purpose. Program developmental and informational services should also be made readily available to those high schools currently without agricultural programs, especially to those located in metro-core areas and in the more sparsely populated areas of northern Michigan.

16. The research used in this study should be developed further for use as an educational management tool for planning and evaluating agricultural education programs at both the state and regional levels. New strategies are needed to achieve better articulation between the agricultural competencies needed for job entry and those competencies being developed at the various levels of public education. Job competencies needed, manpower needs, school program characteristics, and student vocational interests should continue to be monitored on a systematic basis.

APPENDICES

APPENDIX A

FARMER SURVEY: LETTER OF INTRODUCTION AND INTERVIEW SCHEDULES

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF AGRICULTURAL ECONOMICS
AGRICULTURE HALL

EAST LANSING · MICHIGAN · 48824

August 16, 1974

Sometime within the next two weeks you will be receiving a telephone call from me or my research assistant, Marvin Klein. The purpose of the call is to ask you some questions relative to your farm operation and particularly your work force. The information that will be requested is badly needed by both Michigan State University and the State Department of Education in our efforts to help solve the labor problems on Michigan farms.

Your farm was selected as part of a representative sample of Michigan farms. The selection process was carried out with great care because there are only 170 farms in the sample and the information from these farms will represent all farms in Michigan. Bill Bivens and Joe Shaltry of the Cooperative Extension Service in Sanilac County helped with the selections.

The reason the survey is being conducted through telephone conversations instead of having an interviewer come to your farm is that it will require less of your time and the cost of the telephone technique is less than one-half the cost of interviewers traveling to the farm, thereby saving gas and the taxpayer some money. At the same time we believe that the information will be nearly as accurate and complete as it would be if farm visits were made.

From the information supplied by this survey, plus other data we have, we hope to: (1) determine the current number of farm workers in Michigan and the type of agricultural skills they possess, (2) project future agricultural needs for workers, and (3) suggest improvements in the educational and training programs for agricultural workers to ensure that farm labor needs are better satisfied.

The time required to complete the interview will depend heavily on the number of full-time workers you employ. After the first two questions, the caller will give you a rough indication of how much time the remainder of the interview will require. If you can finish it then, fine, but if he has called you at a busy time, he will be glad to call back at your convenience.

We will sincerely appreciate your cooperation in this venture. I want to stress that all information that you give us will be kept in strict confidence and no figures on individual farms will be published. You will receive a report on the study as soon as the results are analyzed.

If you have any questions concerning the survey, feel free to call me collect at 517-355-0131, or write me at 35 Agriculture Hall, M.S.U., East Lansing.

Sincerely,

Allen E. Shapley

Allen E. Shapley
Farm Labor Specialist

AES/jlb

MASTER SCHEDULE
(1 PER FARM)

CARD 1

Farm Number ______________ 1 - 4

Farm Type ______________ 5

Date ______________

Good ______________, I am ______________ of the Department of Agricultural Economics at Michigan State University. We are engaged in a research project with the Department of Education to estimate the demand for agricultural labor in Michigan. We are surveying a number of farmers in Michigan for information about their work force, and you were one of those selected. You should have received a letter recently explaining the study. First,

1. Do you operate a farm?

Yes ________

[ASK FOR OPERATOR] No ________

2. I can give you a rough estimate of the time required to complete this interview if you will tell me how many regular full-time workers (that is those workers who have worked 150 days or more) are currently employed on your farm.

Number ☐ 6,7

It will take approximately

with 0 workers ________ minutes
with 1 worker ________ minutes
with 2 workers ________ minutes
with 3 workers ________ minutes
with 4 workers ________ minutes
with 5 workers ________ minutes

Would you like to complete the questionnaire now, or should I call back at a more convenient time?

---

3. Approximately what percentage of your farm output comes from the following sources:

[READ LIST]

1 Dairy	________%	8 - 10
2 Other Livestock	________%	11 - 13
3 Fruit	________%	14 - 16
4 Vegetables	________%	17 - 19
5 Cash Crop	________%	20 - 22
6 Other (specify) ____________	________%	23 - 25

4. How large is your farm in terms of units of commodity produced? (Only list those filled in in Question #3)

A. Number of Milk Cows	________	26 - 28
B. Head of Livestock		
Kind ____________,	____________	29, 30 - 32
Kind ____________,	____________	33, 34 - 36
C. Acres of Fruit		
Trees	________	37 - 39
Other	________	40 - 42
D. Acres of Vegetables	________	43 - 45
E. Acres of Cash Crops	________	46 - 48
F. Other (specify) ____________	________	49 - 51

CARD 1

5. As operator of the farm, which of the following best explains your position?

[READ LIST]

Owner-Operator	1	52
Partner	2	
Number ________	←	53
Tenant	3	
Employed Manager	4	
Other (explain)	5	
____________________		

Now I would like to ask you some questions about yourself.

6. Would you mind telling me your age? years ________ 54,55

7. How long have you operated in this capacity?
years ________ months ________ 56 - 59

8. What are the three or four most important duties and responsibilities you perform in the operation of the farm?

1 ________	Code ____	60,61
2 ________	Code ____	62,63
3 ________	Code ____	64,65
4 ________	Code ____	66,67

9. What farm and nonfarm work experience did you have when you began working in your present capacity?

Type ________	Code ____	years ________	68 - 71
Type ________	Code ____	years ________	72 - 75
Type ________	Code ____	years ________	76 - 78
		CARD NO. 01	79,80

CARD 2

Farm Number ________ 1 - 4

10. How much formal education have you had?

< High School Diploma	1	5
High School	2	
Short Course	3	
Some College	4	
________ years	←	6
B.S.	5	
Other (specify)	6	
____________________		

11. Did you take Vocational Agricultural courses in high school?

	Yes	1	7
[SKIP TO #13]	No	0	

12. How would you rate Vocational Agricultural courses as taught in high schools today in preparing young people for agricultural jobs?

[READ LIST]

Excellent	1	9
Good	2	
Fair	3	
Poor	4	

13. In the event it should become necessary to fill your position, what skills or work experience would be required of your replacement?

Type ________ Code ________ years ________ 10 - 13

Type ________ Code ________ years ________ 14 - 17

Type ________ Code ________ years ________ 18 - 21

14. How much formal education would be required of your replacement?

< High School	1	22
High School	2	
Short Course	3	
Some College	4	
________ years ←		23
B.S.	5	
Other (specify)	6	
________		

15. Would you require the replacement to have had formal education in agriculture?

Yes	1	24
[SKIP TO #17] No	0	

16. What areas of agriculture should he have had this education in?

	NO	YES	
Soils	0	1	25
Livestock/Dairy	0	1	26
Ag. Engineering	0	1	27
Crops	0	1	28
Horticulture	0	1	29
Farm Management	0	1	30
Other (specify)	0	1	31
________			

17. Do you have an off-farm job?

Yes	1	32
[SKIP TO #22] No	0	

18. What type of work do you do in this job? (Title only)

Job Title ________ Code ________ 33,34

19. Is knowledge of agriculture essential in the performance of your off-farm job?

Yes	1	35
No	0	

20. How many hours per week do you work on this off-farm job?

hours ________ 36,37

21. Approximately how many months or weeks per year do you work on this off-farm job?

months ________

weeks ________ 38,39

22. Are there other operators besides yourself working on the farm?

[GO TO SCHEDULE A] Yes	1	40
No	0	

CARD 2

23. Are there unpaid family members working on the farm? Yes ____1____ 41

IF #2 > 0, GO TO SCHEDULE B No ____0____

24. Approximately how many months of full-time labor does the unpaid family labor represent during the year? months ________ 42,43

25. What are the major activities performed by these unpaid family members?

1 ________ Code ____ 44,45

2 ________ Code ____ 46,47

3 ________ Code ____ 48,49

4 ________ Code ____ 50,51

IF #2 > 0, GO TO SCHEDULE B

CARD NO. 02 79,80

Farm Number ________ 1 - 4

26. Do you employ part-time workers on the farm? (Part-time - employed on a regular basis but work less than 35 hours per week) [GO TO #32] Yes ____1____ 5

No ____0____

27. How many part-time workers do you employ during the year? Number ________ 6 - 8

28. Approximately how many hours of work does this part-time labor represent in a typical week during:

Winter ________ 9 - 11

[READ LIST] Spring ________ 12 - 14

Summer ________ 15 - 17

Fall ________ 18 - 20

29. Briefly describe the major duties and responsibilities of this part-time labor.

1 ________ Code ____ 21,22

2 ________ Code ____ 23,24

3 ________ Code ____ 25,26

30. What skills or experience, if any, do you require your part-time employees to possess?

1 ________ Code ____ 27,28

2 ________ Code ____ 29,30

3 ________ Code ____ 31,32

31. Next year do you intend to employ more, less, or the same number of part-time workers you are employing this year?

More ____1____ 33

Less ____2____

or Same ____3____

CARD 3

32. Do you employ seasonal workers on the farm?
[GO TO #39] Yes ____1____ 34
No ____0____

33. Approximately how many seasonal workers do you employ during the peak employment period? Number ________ 35 - 37

34. What is the average duration of employment for seasonal employees?
<2 Weeks ____1____ 38
2-4 Weeks ____2____
5-7 Weeks ____3____
8-10 Weeks ____4____
More than 10 Weeks ____5____

35. Briefly describe the seasonal employees' major duties and responsibilities.
1 ________________ Code ____ 39,40
2 ________________ Code ____ 41,42
3 ________________ Code ____ 43,44

36. What skills or experience, if any, do you require your seasonal employees to have?
1 ________________ Code ____ 45,46
2 ________________ Code ____ 47,48
3 ________________ Code ____ 49,50

37. Approximately what percentage of these seasonal employees are migrants? Percent ________ 51 - 53

38. Next year do you intend to employ more, less, or the same number of seasonal workers you are employing this year?
More ____1____ 54
Less ____2____
or Same ____3____

39. How many full-time employees do you think you will need on your farm five years from now? Number ________ 55,56
[IF ≤ ANSWER ON Q. 2, SKIP TO #43]

CARD 3

40. I see that you feel you will need more full-time employees five years from now than you have at present. Could you tell me what skills or experience you will want each of these additional employees to possess?

Type ______________ Code ______ years ______ 57 - 60

Type ______________ Code ______ years ______ 61 - 64

Type ______________ Code ______ years ______ 65 - 68

Type ______________ Code ______ years ______ 69 - 71

41. Would you be willing to pay a higher starting wage for an applicant for one of the above jobs if he had successfully completed an agricultural education program designed specifically to prepare him for that job?

[GO TO #31]	Yes	1	72
[GO TO #30b]	No	0	

42. Why not?

____

Code ______________ 73

43. In the event you were seeking farm employees, what type, or types, of placement services would you like to have available to help you?

____

Code ______________ 74,75

44. Do you think total [Dairy / Livestock / Fruit / Vegetable / Cash Crop] production in Michigan will:

Increase	1	
Decrease	2	76
or Remain the Same	3	

45. Do you think the average size of [Dairy / Livestock / Fruit / Vegetable / Cash Crop] farms in Michigan will:

Increase	1	77
Decrease	2	
or Remain the Same	3	

46. For purposes of classifying farms in proper categories, would you tell me in which of the following groups the gross value of all farm products you sold last year falls?

	Less than $40,000	1	
[READ LIST]	$40,000 to $100,000	2	78
	More than $100,000	3	

CARD NO. 03 79,80

THANK YOU VERY MUCH FOR YOUR COOPERATION.

CARD 4 - 10

A
ADDITIONAL OPERATOR

Farm Number ____________ 1 - 4

Operator Number ____________ 5

101. Would you mind telling me his age? years ________ 6,7

102. How long has he operated in this capacity?
years ________ months ________ 8 - 11

103. What are the three or four most important duties and responsibilities he performs in the operation of the farm?

1 ____________ Code ____ 12,13
2 ____________ Code ____ 14,15
3 ____________ Code ____ 16,17
4 ____________ Code ____ 18,19

104. What farm and non-farm work experience did he have when he began working in his present capacity?

Type ____________ Code ____ years ________ 20 - 23
Type ____________ Code ____ years ________ 24 - 27
Type ____________ Code ____ years ________ 28 - 30

105. How much formal education has he had?

< High School Diploma	1	31
High School	2	
Short Course	3	
Some College	4	
______ years		32
B.S.	5	
Other (specify) ____________	6	

106. Did he take Vocational Agricultural courses in high school?

Yes	1	33
No	0	

107. In the event it should become necessary to fill his position, what skills or work experience would be required of his replacement?

Type ____________________ Code ________ years ________ 34 - 37

Type ____________________ Code ________ years ________ 38 - 41

Type ____________________ Code ________ years ________ 42 - 45

108. How much formal education would be required of the replacement?

< High School	1	46
High School	2	
Short Course	3	
Some College	4	
______ years ←		47
B.S.	5	
Other (specify)	6	

____

109. Would you require the replacement to have had formal education in agriculture?

	Yes	1	48
[SKIP TO #111]	No	0	

110. What areas of agriculture should he have had this education in?

	NO	YES	
Soils	0	1	49
Livestock/Dairy	0	1	50
Ag. Engineering	0	1	51
Crops	0	1	52
Horticulture	0	1	53
Farm Management	0	1	54
Other (specify)	0	1	55

____

111. Does he have an off-farm job?

	Yes	1	56
[IF NO MORE OPERATORS, SKIP TO #23]	No	0	

112. What type of work does he do in this job? (Title only)

Job Title ____________________ Code ____________ 57,58

113. Is knowledge of agriculture essential in the performance of his off-farm job?

Yes	1	59
No	0	

114. How many hours per week does he work on this off-farm job?

hours ______ 60,61

115. Approximately how many months or weeks per year does he work on this off-farm job?

months ______ 62,63
weeks ______

[GO TO 2ND SCHEDULE A IF ANOTHER OPERATOR]

[GO TO Q. 23 IF NO MORE OPERATORS] CARD NO. ☐ 79,80

CARD 11 ON

B

FULL-TIME EMPLOYEES

(150 days or more - includes family members if paid wages)

Farm Number	______________	1 - 4
Worker Number	______________	5,6

O.K. I'd like to ask a series of questions about each of these full-time employees. First,

201. What are the three or four most important duties this employee performs on the farm?

1 ______________	Code ______	7,8
2 ______________	Code ______	9,10
3 ______________	Code ______	11,12
4 ______________	Code ______	13,14

202. What is his age?	Age ______	15,16

203. How much formal education does this employee have?

< High School	1	17
High School	2	
Short Course University	3	
Some College	4	
______ years ←		18
B.S.	5	
Other (specify)	6	
______________		

204. What experience did the employee have before coming to work for you?

	NO	YES	
General Farm Experience	0	1	19
Dairy Experience	0	1	20
Livestock	0	1	21
Horticulture	0	1	22
Mechanical	0	1	23
Other (specify)	0	1	24
______________			

205. Does this employee have any physical or mental handicaps that limit his ability to carry out the responsibilities of this position?

Yes	1	25
No	0	

206. Through what employment source did you find this employee?

Employment Service	1	26
Newspaper Ad	2	
Farm Org.	3	
Friend or Neighbor	4	
Worker Applied	5	
Other (specify)	6	

____

207. In the event it should be necessary to replace this employee, how much formal education would you require of the replacement?

< High School	1	27
High School	2	
Short Course University	3	
Some College	4	
________ years ←		28
B.S.	5	
Other (specify)	6	

____

208. What skills or work experience would be required of the replacement?

Type ______________ Code ______________ years __________ 29 - 32

Type ______________ Code ______________ years __________ 33 - 36

Type ______________ Code ______________ years __________ 37 - 40

209. How much cash wages do you pay this worker?

$__________ per | hr | day | wk | mo | yr | $__________ 41 - 45

210. Do you provide benefits to this employee such as:

		NO	YES	
[READ LIST]	Housing	0	1	46
	Utilities	0	1	47
	Room and Board	0	1	48
	Farm Products	0	1	49
	Paid Vacation	0	1	50
	Insurance ________ Type	0	1	51
	Other (specify)	0	1	52
	← Type			53,54
	______________________			
[GO TO Q. 212]	None			

211. What is the approximate cost or value of all these benefits combined to this employee? $________ 55 - 5

212. Approximately how many hours does this man work on a typical day, excluding mealtime, during:

[READ LIST]	Winter	______	59,60
	Spring	______	61,62
	Summer	______	63,64
	Fall	______	65,66

213. How much time off does he have (such as Sundays, every other weekend, etc.)?

____________________ CODE ______ 67,68

214. How long has this employee worked for you in this position?

years ______ months ______ 69 - 7

215. If an employee should leave this position, which one of the following types of jobs would he be most apt to take?

A more responsible job on your farm	1	
A more responsible job on another farm	2	73
A similar job on another farm	3	
A job in agribusiness	4	
A non-agricultural job	5	
Become unemployed	6	
Go on welfare	7	
Other (specify)	8	

____

[GO TO NEXT SCHEDULE B IF MORE FULL-TIME WORKERS (SEE Q. 2)]

[GO TO Q. 26]

CARD NO. ☐ 79,8

APPENDIX B

NON-FARM AGRICULTURAL SURVEY: LETTER OF INTRODUCTION AND INTERVIEW SCHEDULE

COOPERATIVE EXTENSION SERVICE
MICHIGAN STATE UNIVERSITY · EAST LANSING · MICHIGAN 48823
AND U.S. DEPARTMENT OF AGRICULTURE COOPERATING

Agricultural Economics
Agriculture Hall

Sometime within the next two weeks you will be receiving a telephone call from me or one of my research assistants. The purpose of the call is to ask you some questions relative to your business operation and particularly your work force. The information that will be requested is badly needed by both Michigan State University and the State Department of Education in our efforts to help solve the labor problems in Michigan Agribusiness.

Your business was selected as part of a representative sample of Michigan Agribusiness firms. The selection process was carried out with great care because there are only a limited number of firms in the sample.

The reason the survey is being conducted through telephone conversations instead of having an interviewer come to your firm is that it will require less of your time and the cost of the telephone technique is less than one half the cost of interviewers making personal visits to businessess thereby saving gas and the taxpayer some money. At the same time we believe that the information will be nearly as accurate and complete as it would be if personal visits were made.

From the information supplied by this survey, plus other data we have, we hope to: (1) determine the current number of workers requiring agriculture skills in Michigan and the type of agricultural skills they possess, (2) project future agricultural needs for workers, and (3) suggest improvements in the educational and training programs for agricultural workers to ensure that agribusiness labor needs are better satisfied.

We will sincerely appreciate your cooperation in this venture. I want to stress that all information that you give us will be kept in strict confidence and no figures on individual firms will be published. You will receive a report on the study as soon as the results are analyzed.

If you have any questions concerning the survey, feel free to call me collect at 517-355-1785, or write me at 326 Erickson Hall, M.S.U., East Lansing.

Sincerely,

Frank Bobbitt

Frank Bobbitt
Agriculture Manpower Specialist

ca

Name of Business ______________________ Business Number __________

Address ______________________

______________________ Date __________

Phone Number ______________________

Person Interviewed ______________________

Position ______________________

1. How many employees, including management personnel, are currently employed in your business organization?

Number __________ 260

2. How many man/hours of work does your part-time labor represent during a typical year (Part-time - work less than 35 hours per week).

Man/hours __________

3. How many man/hours of work does your seasonal labor represent during a typical year.

Man/hours __________

4. Could you give me the job titles of those full-time employees in your business organization that utilize a knowledge or skill in agriculture in the performance of their job? (Any agricultural skills or knowledge that are necessary in the production, marketing or servicing of agricultural products.)

Page ______
Bus. #______

Col. 1 Job Title	Col. 2 Major Duties & Responsibilities List one or two of the most important duties & responsibilities for this job that require agricultural skills	Col. 3 No. F.T.	Col. 4 Add. F.T. Needed	Col. 5 Avg. No. Replace /Yr.	Col. 6 Proj. No. 5 Yr.	Col. 7 Minimum Education Level for Beginning Employees. 1. < H.S. 2. H.S. 3. Short Course 4. Some College 5. B.S. 6. Other 7. No Min.	Col. 8 Would Vo. Ag. training be valuable? 0. Yes 1. No 2. Don't Know	Col. 9 How much work exp. in this or similar job title do you require of applicants? 1. None 2. < 3 mos. 3. 3-12 mos. 4. > 1 year	Col. 10 Current Minimum & Maximum Rate of Pay.	
									Minimum	Maximum

APPENDIX C

FARM LABOR: HIRED WORKERS ON FARMS, BY MONTHS, MICHIGAN, 1969-73

FARM LABOR: HIRED WORKERS ON FARMS, BY MONTHS, MICHIGAN, 1969-73[1]

MONTH	1973	1972	1971	1970	1969
	1,000 persons				
January	**14**	10	15	15	14
February	**13**	13	15	15	14
March	**16**	16	17	16	14
April	**18**	19	19	19	18
May	**25**	24	23	21	20
June	**35**	31	30	27	25
July	**37**	44	38	38	37
August	**33**	39	37	38	39
September	**32**	30	29	26	25
October	**22**	30	28	33	28
November	**17**	16	16	18	14
December	**12**	11	14	13	14
Annual Average	**23**	24	23	23	22

[1] Hired workers are persons employed during the last full calendar week ending at least one day before the end of the month.

FARM LABOR: FAMILY WORKERS ON FARMS, BY MONTHS, MICHIGAN, 1969-73

MONTH	1973	1972	1971	1970	1969
	1,000 persons				
January	**74**	71	92	98	97
February	**78**	87	101	108	106
March	**86**	91	102	108	107
April	**107**	105	109	119	113
May	**116**	131	121	134	125
June	**113**	117	117	135	123
July	**116**	119	122	128	134
August	**112**	109	115	125	124
September	**102**	111	109	117	122
October	**100**	102	102	117	113
November	**91**	94	93	104	106
December	**79**	72	85	96	97
Annual Average	**98**	101	106	116	114

FARM LABOR: TOTAL WORKERS ON FARMS, BY MONTHS, MICHIGAN, 1969-73

MONTH	1973	1972	1971	1970	1969
	1,000 persons				
January	**88**	81	107	113	111
February	**91**	100	116	123	120
March	**102**	107	119	124	121
April	**125**	124	128	138	131
May	**141**	155	144	155	145
June	**148**	148	147	162	148
July	**153**	163	160	166	171
August	**145**	148	152	163	163
September	**134**	141	138	143	147
October	**122**	132	130	150	141
November	**108**	110	109	122	120
December	**91**	83	99	109	111
Annual Average	**121**	125	129	139	136

SOURCE: Michigan Crop Reporting Service, Michigan Agricultural Statistics, 1974 Lansing: Michigan Department of Agriculture, June, 1974), p. 50.

APPENDIX D

COUNTY BUSINESS PATTERNS, 1970: MICHIGAN

County Business Patterns 1970
Michigan

Industry	Number of Employees Mid-March Pay Period	Total Reporting Units	No. of Reporting Units, by Employment-Size Class			
			1-3	4-7	8-19	20-up
AGRICULTURAL SERVICES--Forestry Fisheries						
AGRICULTURAL SERVICES and Hunting						
Miscellaneous Agricultural Services	No Data	40	19	8	9	4
Animal Husbandry Services	1,864	394	244	96	43	11
Horticultural Services	1,678	336	201	83	38	14
Forestry Services	113	14	11	1	0	2
Fisheries	231	32	19	6	4	3
MANUFACTURING						
LUMBER AND WOOD PRODUCTS	11,980	932	357	208	211	156
FARM MACHINERY AND EQUPMENT	5,120	48	11	7	10	20
PROCESSING						
MEAT						
Meat Packing Plants	2,410	101	14	20	35	32
Sausages and Prepared Meats	2,856	66	11	7	14	34
Poultry Dressing Plants	312	11	2	2	2	5
DAIRY PRODUCTS						
Butter	294	12	4	1	1	6
Cheese	416	18	3	2	6	7
Milk	829	13	0	0	5	8
Ice Cream	611	31	9	3	9	10
Fluid Milk	5,112	104	18	9	25	52
FRUITS AND VEGETABLES						
Canned Specialties	No Data	5	1	0	1	3
Canned Fruits and Vegetables	No Data	49	9	5	14	21
Pickles, Sauces	2,019	40	11	6	8	15
Frozen Fruits and Vegetables	2,248	32	1	5	9	17
GRAIN MILLING						
Flour and other	859	15	4	0	1	10
Feed, Animal and Fowl	No Data	29	12	4	8	5
Cereals, Preparation	No Data	2	0	0	0	2
SUGAR						
Beets	1,002	6	0	0	0	6
LUMBER AND WOOD PRODUCTS						
LOGGING CAMPS	1,552	354	196	102	50	6
SAW MILLS AND PLANING MILLS	2,977	213	71	42	51	49

County Business Patterns 1970 - Cont.

Industry	Number of Employees Mid-March Pay Period	Total Reporting Units	No. of Reporting Units, by Employment-Size Class			
			1-3	4-7	8-19	20-up
AGRICULTURAL CHEMICALS						
FERTILIZERS	178	9	1	4	2	2
FERTILIZERS, MIXING ONLY	194	10	2	3	1	4
AGRICULTURAL CHEMICALS, NEC	No Data	6	2	1	1	2
WHOLESALE TRADE						
DAIRY PRODUCTS	1,344	132	52	35	28	17
POULTRY AND POULTRY PRODUCTS	975	75	27	17	17	14
MEAT AND MEAT PRODUCTS	2,969	210	48	50	80	32
FISH	245	31	11	7	10	3
FRESH FRUITS AND VEGETABLES	2,081	202	80	36	51	35
FARM PRODUCTS (RAW)						
Grain	1,687	133	27	47	41	18
Livestock	617	39	8	4	12	15
Farm Product Raw Materials, NEC	78	17	10	6	0	1
FARM MACHINERY AND EQUIPMENT	705	43	16	8	9	10
RETAIL TRADE						
FARM EQUIPMENT DEALERS	2,350	431	191	121	105	6
MEAT AND FISH (Seafood) MARKETS	1,636	278	126	78	67	7
FRUIT AND VEGETABLES MARKETS	591	102	60	22	13	7
DAIRY PRODUCTS	1,705	144	54	46	33	11
FARM AND GARDEN	3,207	438	210	123	79	26
FLORISTS	2,708	503	253	155	77	18

SOURCE: Compiled from U.S., Department of Commerce, Bureau of the Census, County Business Patterns, 1970: Michigan CBP-70-24, pp. 12-20.

NOTE: NEC denotes "Not Elsewhere Classified".

APPENDIX E

TASK ANALYSIS SURVEY INSTRUMENTS OR CRITICAL INCIDENT LISTS

(SELECTED PAGES ONLY)

MICHIGAN STATE UNIVERSITY

Date Completed ________

Occupation: FARMING -- 85.1

Code No. ______

NAME: ______________________________ POSITION: ______________________________

EMPLOYER: ______________________________ TELEPHONE: ______________________________

ADDRESS: ____
(Street) (City) (State) (Zip)

Number of years experience in occupation: ______________________________

Number of hours in work week: ______________ in work day: ______________

CRITICAL INCIDENT

Job Skills:

1. A critical incident is a skill or knowledge needed (desirable) for entry level employment in farming following high school graduation.
2. Please check each item in the skills list indicating answers to the following:
   - a) Is the item an entry level skill for a high school graduate?
   - b) What is the degree of importance to a person engaged in farming?

Definitions:

Essential -- Of utmost importance; competence in performing this task is absolutely necessary for entry level employment.

Very Important -- Competence in performing this task has much influence or effect on entry level employability.

Some Importance -- Competence in performing this task has some influence on entry level employability.

Minor Importance -- Competence in performing this task has no effect on entry level employability.

Not Needed -- Task does not apply for entry level employment.

SPECIAL NOTE

1. Since there are many types of farming in Michigan we suggest you check the lists of skills and knowledges as they apply to the type(s) of farming with which you are most familiar.

2. Please check below the type(s) of farming in which you are working:

Vegetable, beet, potato ____

Grain and/or beans ____

Livestock: beef, swine, sheep ____

Dairy ____

Poultry ____

Fruit, tree ____

Fruit, bush, vine ____

Other (specify) ____________________

____

MICHIGAN STATE UNIVERSITY
AGRICULTURAL EDUCATION

CRITICAL INCIDENT ANALYSIS

Occupation: FARMING

JOB SKILLS	Relative Importance —						Code
	Entry Skill	Not Needed	Minor Importance	Some Importance	Very Important	Essential	
Is able to: Soil Program							
1. Determine best use for each land capability class on the farm.	____	____	____	____	____	____	85001
2. Identify type of farming appropriate for the land capability classes of the farm.	____	____	____	____	____	____	85002
3. Use results of soil tests to specify fertilizer analysis for each crop on the farm.	____	____	____	____	____	____	85003
4. Identify crops appropriate for the soils of the farm.	____	____	____	____	____	____	85004
5. Specify amount of fertilizer per acre for crops to be grown on the farm.	____	____	____	____	____	____	85005
6. Determine form of plant food to use on the crops of the farm (dry, liquid, gas).	____	____	____	____	____	____	85006
7. Specify kind & amount of liming material to reach desired pH level in the soil.	____	____	____	____	____	____	85007
8. Specify drainage programs consistent with the crop & the soil type.	____	____	____	____	____	____	85008
9. Maintain organic matter level in the soil.	____	____	____	____	____	____	85009
10. Prepare soil for the crops to be grown.	____	____	____	____	____	____	85010
11. Maintain desirable soil tilth in the soils of the farm.	____	____	____	____	____	____	85011
12. Take soil samples to deliver to the soil testing laboratory.	____	____	____	____	____	____	85012
13. Choose appropriate tillage equipment for the kind of soil & the crops to be grown on the farm.	____	____	____	____	____	____	85013
Crop Program							
14. Choose appropriate varieties of each crop.	____	____	____	____	____	____	85014
15. Plant seeds and/or plants at appropriate rate & spacing in the row & in row width.	____	____	____	____	____	____	85015
16. Plant seeds and/or plants at appropriate depth.	____	____	____	____	____	____	85016

MICHIGAN STATE UNIVERSITY

Occupation: FARMING -- 85.1

CRITICAL INCIDENT

Job Knowledges:

1. A critical incident is a skill or a knowledge needed (desirable) for entry level employment following high school graduation.
2. Please check each item in the knowledges list indicating the relative desirability of the item for the types of farming with which you are most familiar.

MICHIGAN STATE UNIVERSITY
AGRICULTURAL EDUCATION

CRITICAL INCIDENT ANALYSIS

Occupation: FARMING

JOB KNOWLEDGES	This Knowledge Is — Unnecessary	Desirable	Essential	Code
Must Understand:				
Soil Program				
1. Characteristics that determine land capability class.	____	____	____	85501
2. Factors which limit capability of soil.	____	____	____	85502
3. Relationship of land capability & type of farming which is appropriate.	____	____	____	85503
4. Relationship of land capability classes & crops which are appropriate.	____	____	____	85504
5. Optimum levels of NPK & minor elements for specific crops.	____	____	____	85505
6. Relative costs of various forms of plant nutrients (liquid, solid, gas).	____	____	____	85506
7. Relative rates of availability of various forms of plant nutrients (liquid, solid, gas).	____	____	____	85507
8. pH levels required by various crops for optimum production.	____	____	____	85508
9. Kinds of liming materials commonly available in the area.	____	____	____	85509
10. Effectiveness of various kinds of liming materials on the soils of the area.	____	____	____	85510
11. Relation of drainage to production of various crops of the area.	____	____	____	85511
12. Function of organic matter in the soil.	____	____	____	85512
13. Various methods of adding organic matter to the soil.	____	____	____	85513
14. Water requirements of crops commonly grown in the area.	____	____	____	85514
15. Methods of determining quantity of water needed to supplement natural rainfall for specified crops.	____	____	____	85515
16. Characteristics of a desirable seed bed for crops to be grown in the area.	____	____	____	85516
17. What tillage equipment & methods will result in a desirable seed bed.	____	____	____	85517
18. Factors affecting soil tilth.	____	____	____	85518
19. Depth from which to take samples for soil tests.	____	____	____	85519
20. The area to be represented by a specific soil sample.	____	____	____	85520
21. Characteristics of a composite soil sample.	____	____	____	85521
22. The effect of each kind of tillage equipment on soil.	____	____	____	85522
23. The soil properties that determine soil management groups & units.	____	____	____	85523
Crop Program				
24. The adaptability of crops to various soils of the area.	____	____	____	85524
25. The characteristics of various crop varieties.	____	____	____	85525
26. The most appropriate varieties for various soil types of the area.	____	____	____	85526
27. The seed treatments appropriate for seeds to be planted.	____	____	____	85527

MICHIGAN STATE UNIVERSITY

Occupation: ENVIRONMENTAL (ORNAMENTAL) HORTICULTURE -- 85.2 Code No. ______

NAME: ______________________ POSITION: ______________________

EMPLOYER: ______________________ TELEPHONE: ______________________

ADDRESS: ____
(Street) (City) (State) (Zip)

Number of years experience in occupation: ______________________

Number of hours in work week: ______________ in work day: ______________

- -

CRITICAL INCIDENT

Job Skills:

1. A critical incident is a skill or a knowledge needed (desirable) for entry level employment in Environmental (Ornamental) Horticulture following high school graduation.

2. Please check each item in the skills list indicating answers to the following:

   a) Is the item an entry level skill for a high school graduate?
   b) What is the degree of importance to a person engaged in environmental (ornamental horticulture?

Definitions:

Essential -- Of utmost importance; competence in performing this task is absolutely necessary for entry level employment.

Very Important -- Competence in performing this task has much influence or effect on entry level employability.

Some Importance -- Competence in performing this task has some influence on entry level employability.

Minor Importance -- Competence in performing this task has no effect on entry level employability.

Not Needed -- Task does not apply for entry level employment.

SPECIAL NOTE

1. Since there are several types of environmental horticulture businesses in Michigan we suggest you check the lists of skills and knowledges as they apply to the type(s) of environmental horticulture with which you are most familiar.

2. Please check below the type(s) of environmental horticulture business in which you are working:

Nursery Production ____

Garden Center ____

Bedding Plants ____

Landscaping ____

Groundskeeping, parks, etc. ____

Arboriculture ____

Turf and Sprinkler ____

Other (specify) ____________________

____

MICHIGAN STATE UNIVERSITY
AGRICULTURAL EDUCATION

CRITICAL INCIDENT ANALYSIS

Occupation: ENVIRONMENTAL (ORNAMENTAL) HORTICULTURE

JOB SKILLS	Entry Skill	Not Needed	Minor Importance	Some Importance	Very Important	Essential	Code
	Relative Importance —						
Is able to:							
Propagation							
1. Bud graft.	___	___	___	___	___	___	85001
2. Make stem cuttings.	___	___	___	___	___	___	85002
3. Make root cuttings.	___	___	___	___	___	___	85003
4. Make cleft, whip, tongue, & side grafts.	___	___	___	___	___	___	85004
5. Select cutting & grafting stock.	___	___	___	___	___	___	85005
6. Store cutting & grafting stock.	___	___	___	___	___	___	85006
7. Line out rooted cuttings.	___	___	___	___	___	___	85007
8. Fertilize rooted cuttings.	___	___	___	___	___	___	85008
9. Prepare media for growing rooted cuttings.	___	___	___	___	___	___	85009
10. Sow seeds of plants.	___	___	___	___	___	___	85010
11. Provide suitable seed-bed for various seeds.	___	___	___	___	___	___	85011
12. Transplant seedlings.	___	___	___	___	___	___	85012
13. Adjust lighting for optimum growth of seedlings.	___	___	___	___	___	___	85013
14. Control temperature for optimum growth of seedlings.	___	___	___	___	___	___	85014
15. Control moisture for optimum growth seedlings.	___	___	___	___	___	___	85015
Arboriculture (Use & Care of Individual Trees)							
16. Identify trees & shrubs used for environmental purposes to species.	___	___	___	___	___	___	85016
17. Plant bare root trees & shrubs.	___	___	___	___	___	___	85017
18. Prepare balled trees.	___	___	___	___	___	___	85018
19. Plant balled trees.	___	___	___	___	___	___	85019
20. Plant trees & shrubs with tree spade.	___	___	___	___	___	___	85020
21. Prune transplanted trees & shrubs used for environmental purposes.	___	___	___	___	___	___	85021
22. Prune flowering trees & shrubs.	___	___	___	___	___	___	85022
23. Prune standard trees which are used for environmental purposes.	___	___	___	___	___	___	85023
24. Prune coniferous species which are used for environmental purposes.	___	___	___	___	___	___	85024
25. Fertilize trees & shrubs by various methods.	___	___	___	___	___	___	85025

MICHIGAN STATE UNIVERSITY

Occupation: ENVIRONMENTAL (ORNAMENTAL) HORTICULTURE -- 85.2

CRITICAL INCIDENT

Job Knowledges:

1. A critical incident is a skill or a knowledge needed (desirable) for entry level employment following high school graduation.
2. Please check each item in the knowledges list indicating the relative desirability of the item for the types of farming with which you are most familiar.

MICHIGAN STATE UNIVERSITY
AGRICULTURAL EDUCATION

CRITICAL INCIDENT ANALYSIS

Occupation: ENVIRONMENTAL (ORNAMENTAL) HORTICULTURE

	JOB KNOWLEDGES	This Knowledge Is —			Code
		Unnecessary	Desirable	Essential	

Must understand:

Propagation

1.	Proper time to make bud grafts.	____	____	____	85501
2.	Kinds of cuttings.	____	____	____	85502
3.	Environmental conditions needed for successful cuttings & grafts both before & after the process.	____	____	____	85503
4.	Media needed for growing rooted cuttings.	____	____	____	85504
5.	Effect of intensity of light on growing cuttings.	____	____	____	85505
6.	Effect of hours of light on growing cuttings.	____	____	____	85506
7.	Appropriate seeding conditions for various kinds of seeds.	____	____	____	85507
8.	Appropriate media for growing seedlings.	____	____	____	85508
9.	How to control growth of plants through lighting.	____	____	____	85509
10.	Effects of temperature on growth of seedlings.	____	____	____	85510
11.	Characteristics of seedlings which indicate quality.	____	____	____	85511
12.	Effects of mositure on optimum growth of seedlings.	____	____	____	85512

Arboriculture (Use & Care of Individual Trees)

13.	Basic tree functions especially related to planting & pruning of trees & shrubs.	____	____	____	85513
14.	Soil characteristics related to growth of trees & shrubs.	____	____	____	85514
15.	Fertilizer labeling.	____	____	____	85515
16.	Responses of trees & shrubs to specific planting methods.	____	____	____	85516
17.	Needs for pruning of trees & shrubs.	____	____	____	85517
18.	Timing of pruning of trees & shrubs.	____	____	____	85518
19.	Pruning tools.	____	____	____	85519
20.	Pruning safety practices.	____	____	____	85520
21.	Fertilization methods for trees & shrubs.	____	____	____	85521
22.	Fertilization timing for trees & shrubs.	____	____	____	85522
23.	Environmental relationships of grass & trees.	____	____	____	85523
24.	Wound healing in trees.	____	____	____	85524
25.	Tree wound dressings.	____	____	____	85525
26.	Tools for cavity & wound treatment.	____	____	____	85526
27.	Disease control methods for trees & shrubs.	____	____	____	85527
28.	Insect control methods for trees & shrubs.	____	____	____	85528

MICHIGAN STATE UNIVERSITY

Date Completed ______

Occupation: FARM IMPLEMENT REPAIR -- 85.3

Code No. ______

NAME: ______________________ POSITION: ______________________

EMPLOYER: ______________________ TELEPHONE: ______________________

ADDRESS: ____
(Street) (City) (State) (Zip)

Number of years experience in occupation: ______________________

Number of hours in work week: ______________ in work day: ______________

CRITICAL INCIDENT

Job Skills:

1. A critical incident is a skill or a knowledge needed (desirable) for entry level employment in Farm Implement Repair following high school graduation.
2. Please check each item in the skills list indicating answers to the following:
   - a) Is the item an entry level skill for a high school graduate?
   - b) What is the degree of importance to a person engaged in farm implement repair?

Definitions:

Essential -- Of utmost importance; competence in performing this task is absolutely necessary for entry level employment.

Very Important -- Competence in performing this task has much influence or effect on entry level employability.

Some Importance -- Competence in performing this task has some influence on entry level employability.

Minor Importance -- Competence in performing this task has no effect on entry level employability.

Not Needed -- Task does not apply for entry level employment.

MICHIGAN STATE UNIVERSITY
AGRICULTURAL EDUCATION

CRITICAL INCIDENT ANALYSIS

Occupation: FARM IMPLEMENT REPAIR

	JOB SKILLS	Relative Importance —						Code
		Entry Skill	Not Needed	Minor Importance	Some Importance	Very Important	Essential	
	Is able to:							
	Farm Power							
1.	Identify diesel fueled internal combustion engine.	___	___	___	___	___	___	85001
2.	Identify gasoline fueled internal combustion engine	___	___	___	___	___	___	85002
3.	Identify 4-stroke cycle engine.	___	___	___	___	___	___	85003
4.	Identify 2-stroke cycle engine.	___	___	___	___	___	___	85004
5.	Check & clean (or replace) the filters in the fuel line of a gasoline fueled engine.	___	___	___	___	___	___	85005
6.	Clean the carburetor of a gasoline fueled engine.	___	___	___	___	___	___	85006
7.	Adjust the carburetor of a gasoline fueled engine.	___	___	___	___	___	___	85007
	Tools							
8.	Identify hand & power tools commonly used for farm implement repair.	___	___	___	___	___	___	85008
9.	Correctly use hand & power tools commonly found in the farm implement repair shop.	___	___	___	___	___	___	85009
10.	Observe & follow safety practices when working in the farm machinery repair shop.	___	___	___	___	___	___	85010
	Welding							
11.	Set & adjust the controls on the oxy-acetylene welding equipment commonly found in the farm implement repair shop & for the kind of job to be done.	___	___	___	___	___	___	85011
12.	Set & adjust the controls on the arc welding equipment commonly found in the farm implement repair shop & for the kind of job to be done.	___	___	___	___	___	___	85012
13.	Select appropriate welding rods for the kind of job to be done.	___	___	___	___	___	___	85013
14.	Prepare metal for welding.	___	___	___	___	___	___	85014
15.	Perform the kind and/or position welds commonly needed for repair of farm implements.	___	___	___	___	___	___	85015

MICHIGAN STATE UNIVERSITY

Occupation: FARM IMPLEMENT REPAIR -- 85.3

CRITICAL INCIDENT

JOB KNOWLEDGES:

1. A critical incident is a skill or a knowledge needed (desirable) for entry level employment following high school graduation.
2. Please check each item in the knowledge list indicating the relative desirability of the item for Farm Implement Repair.

MICHIGAN STATE UNIVERSITY
AGRICULTURAL EDUCATION

CRITICAL INCIDENT ANALYSIS

Occupation: FARM IMPLEMENT REPAIR

JOB KNOWLEDGES	This Knowledge Is — Unnecessary	Desirable	Essential	Code
Must understand:				
Farm Power				
1. Basic principles of operation of compression ignition engines.	___	___	___	85501
2. Basic principles of operation of spark ignition engines.	___	___	___	85502
3. Basic differences between diesel & gasoline fueled engines.	___	___	___	85503
4. Advantages & common agricultural uses of the various types of engines.	___	___	___	85504
5. The specifications (directions) in the manual for cleaning and/or replacing filters in the fuel line of a gasoline fueled engine.	___	___	___	85505
6. The specifications (directions) in the manual for cleaning and/or adjusting the carburetor of a gasoline fueled engine.	___	___	___	85506
Tools				
7. The kind & purpose of hand & power tools commonly found in the farm implement repair shop.	___	___	___	85507
8. The sizes & units of measurement of tools commonly used in the farm implement repair shop.	___	___	___	85508
9. The measuring instruments commonly used in the farm implement repair shop.	___	___	___	85509
10. The safety practices to be followed when using hand or power tools in the farm implement repair shop.	___	___	___	85510
Welding				
11. The purpose of the controls on the oxy-acetylene welder.	___	___	___	85511
12. The purpose of the controls on the arc welder.	___	___	___	85512
13. The appropriate size & kind of rod for specified welding jobs.	___	___	___	85513
14. The condition of metal needed for satisfactory welds on farm equipment.	___	___	___	85514
15. The appropriate kind of welds commonly needed on farm equipment.	___	___	___	85515
16. The use of tables & charts used in connection with welding jobs.	___	___	___	85516
17. Settings of arc welder (amperage, voltage, polarity).	___	___	___	85517
18. Polarity, direct & alternating current.	___	___	___	85518
19. Safety practices for the welder.	___	___	___	85519
20. Safety practices to equipment when welding (fires, damage to buildings, livestock, etc.).	___	___	___	85520
21. The effect of heat on metals.	___	___	___	85521
22. The characteristics of a satisfactory weld.	___	___	___	85522

MICHIGAN STATE UNIVERSITY

Occupation: AGRICULTURAL & BIOLOGICAL TECHNICAL SERVICES -- 85.4 Code No. ________

NAME: ______________________________ POSITION: ______________________________

EMPLOYER: ______________________________ TELEPHONE: ______________________________

ADDRESS: ____
(Street) (City) (State) (Zip)

Number of years experience in occupation: ______________________________

Number of hours in work week: ______________ in work day: ______________

- -

CRITICAL INCIDENT

Job Skills:

1. A critical incident is a skill or a knowledge needed (desirable) for entry level employment into the Agricultural and Biological Technical Services following high school graduation.

2. Please check each item in the skills list indicating answers to the following:

   a) Is the item an entry level skill for a high school graduate?
   b) What is the degree of importance to a person engaged in agricultural biology?

Definitions:

Essential -- Of utmost importance; competence in performing this task is absolutely necessary for entry level employment.

Very Important -- Competence in performing this task has much influence or effect on entry level employability.

Some Importance -- Competence in performing this task has some influence on entry level employability.

Minor Importance -- Competence in performing this task has no effect on entry level employability.

Not Needed -- Task does not apply for entry level employment.

SPECIAL NOTE

1. Since there are many types of agricultural and biological technical services we suggest you check the lists of skills and knowledges as they apply to the type(s) of technical services with which you are familiar.

2. Please check the type(s) of technical services in which you have had experience:

Food Processing ____

Animal Laboratories ____

Agricultural Chemicals ____

Water Resources ____

Grain, Feed, and Seed Services ____

Waste Disposal ____

Other (specify) ________________

____

MICHIGAN STATE UNIVERSITY
AGRICULTURAL EDUCATION

CRITICAL INCIDENT ANALYSIS

Occupation: AGRICULTURAL & BIOLOGICAL TECHNICAL SERVICES

			Relative Importance —				
JOB SKILLS	Entry Skill	Not Needed	Minor Importance	Some Importance	Very Important	Essential	Code
Is able to: Animal--domestic farm animals or birds, zoo animals or birds, laboratory animals or birds							
1. Approach, handle, & work with live animals to prevent personal injury.							85001
2. Approach, handle, & work with live animals & birds in a humane way.							85002
3. Diplomatically approach people when enforcing laws & regulations.							85003
4. Clean & sterilize laboratory glassware, equipment, & instruments used in administering prescribed medicines & treatments to animals & birds.							85004
5. Prepare & read the results of bacteria & mold cultures.							85005
6. Take blood samples.							85006
7. Perform blood testing procedures.							85007
8. Maintain breeding records of animals & birds.							85008
9. Recognize early signs of abnormal health conditions in animals & birds.							85009
10. Administer medication as prescribed.							85010
11. Dehorn animals when needed.							85011
12. Castrate animals.							85012
13. Dock lambs & remove tails from pigs.							85013
14. Formulate rations as directed.							85014
15. Observe animals for heat & signs of parturition.							85015
16. Assist animals in parturition.							85016
17. Treat newborn animals to prevent infection.							85017
18. Assist newborn animals to nurse.							85018
19. Give animals or birds prescribed injections to prevent diseases & nutritional deficiencies.							85019
20. Remove needle teeth of young pigs.							85020
21. Shear sheep.							85021

MICHIGAN STATE UNIVERSITY

Occupation: AGRICULTURAL & BIOLOGICAL TECHNICAL SERVICES -- 85.4

CRITICAL INCIDENT

Job Knowledges:

1. A critical incident is a skill or a knowledge needed (desirable) for entry level employment following high school graduation.
2. Please check each item in the knowledges list indicating the relative desirability of the item for an Agricultural Biology Technician.

MICHIGAN STATE UNIVERSITY
AGRICULTURAL EDUCATION

CRITICAL INCIDENT ANALYSIS

Occupation: AGRICULTURAL & BIOLOGICAL TECHNICAL SERVICES

JOB KNOWLEDGES	This Knowledge Is —			Code
	Unnecessary	Desirable	Essential	
Must understand:				
Animal: domestic farm animals or birds, zoo animals or birds, laboratory animals or birds				
1. The temperament of the animals or birds being studied.	___	___	___	85501
2. The correct way to approach animals or birds.	___	___	___	85502
3. The correct use of restraining techniques & devices.	___	___	___	85503
4. The use of protective devices.	___	___	___	85504
5. The necessary precautions to take in handling animals or birds suspected of disease or sickness.	___	___	___	85505
6. Which diseases are communicable to man & by what methods.	___	___	___	85506
7. The limit of stress for the animal or bird being handled.	___	___	___	85507
8. The laws & regulations governing the care & treatment of animals & birds.	___	___	___	85508
9. Different ways people may react when informed of violations of laws or regulations regarding animals & birds.	___	___	___	85509
10. The importance of obtaining cooperation without the use of threats or the force of the law.	___	___	___	85510
11. The need for clean & sterilized laboratory equipment.	___	___	___	85511
12. The materials & techniques used in cleaning & sterilizing glassware & equipment.	___	___	___	85512
13. Materials used in making laboratory cultures.	___	___	___	85513
14. Techniques used in making laboratory cultures.	___	___	___	85514
15. How to determine & record results of laboratory cultures.	___	___	___	85515
16. The basic anatomy & physiology of the animal or bird being worked with.	___	___	___	85516
17. How to preserve blood samples.	___	___	___	85517
18. Exact procedure to perform tests being made.	___	___	___	85518
19. How to record & interpret observations of tests made.	___	___	___	85519
20. Importance of maintaining accurate breeding records.	___	___	___	85520
21. Methods of recording data related to breeding, production, health, & reaction of animals or birds.	___	___	___	85521
22. How to prepare breeding certificates & applications for registration papers.	___	___	___	85522
23. Normal health behavior of animals or birds.	___	___	___	85523

APPENDIX F

SOME SELECTED CHARACTERISTICS OF THE TASK ANALYSIS SURVEY RESPONDENTS

Table F-1 --Respondents in Agricultural Production by Job Title, Years of Experience in Occupation and Farming Industries in Which Engaged.

Respondent Identification Code No.	Job Title N=46	Years of Experience in Occupation[a]	Farming Industries in Which Engaged[b]						
			Dairy	Bush/Vine Fruit	Tree Fruit	Grain/ Bean	Livestock (Beef/Swine/ Sheep)	Poultry	Vegetable/ Beet/ Potato
101	Farmer	5							X
102	Farm Foreman	6							X
103	Farmer	15							X
104	Farm--Equipment Operator	4				X			X
105	Farm Hand, General	6				X			X
106	Farmer	15				X			X
107	Farmer	15				X			X
108	Farmer	6				X	X		X
109	Farmer	15	X			X	X		X
110	Farmer	6		X		X	X		X
111	Farmer	30	X			X			X
112	Farmer	15		X	X	X			X
113	Farmer	10		X		X			X
114	Farmer	2				X			
115	Farmer	6				X			
116	Farmer	10				X			
117	Farmer	29				X			
118	Farmer	30				X			
119	Farmer	1				X	X		
120	Farmer	8				X	X		
121	Farmer	9				X	X		
122	Farmer	18				X	X		
123	Farmer	15				X	X		
124	Farmer	4	X			X	X		
125	Farm Hand, General I	5	X		X	X	X		
126	Farm Manager	5				X	X	X	
127	Farmer	31				X	X	X	
128	Farmer	4	X			X			
129	Farmer	4	X			X			
130	Farmer	4	X			X			

131	Farmer	20				X		X	
132	Farmer	20				X		X	
133	Farmer	30				X		X	
134	Farmer	12					X		
135	Farmer	30	X		X		X		
136	Farmer	14	X						
137	Farmer	15	X						
138	Farmer	16	X						
139	Farmer	18	X						
140	Farmer	30	X						
141	Farmer	32	X						
142	Farm Hand, General I	5						X	
143	Farm Hand, General II	1			X				
144	Farmer	15			X				
145	Farmer	4		X					
146	Farm Manager (Vineyard)	10		X					
Total			14	5	5	30	14	6	13

[a] The mean years of experience in occupation was 13.2.

[b] The mean number of farming industries per respondent was 1.9.

Table F-2--Respondents in Environmental Horticulture by Job Title, Years of Experience in Occupation, and Industries in Which Engaged.

Respondent Identification Code No.	Job Title N=26	Years of Experience in Occupation[a]	Industries in Which Engaged[b]						
			Arboriculture	Bedding Plants	Garden Center	Grounds-keeping/Parks	Landscaping	Nursery Production	Turf and Sprinkler
201	Laborer, Nursery	1		X	X			X	
202	Nursery Farmer	2		X	X			X	
203	Salesperson, House Plants	2		X	X			X	
204	Nursery Worker	6		X	X			X	
205	Laborer, Nursery	15		X	X	X	X	X	X
206	Nursery Manager	1			X		X	X	X
207	Greenhouse Worker	1		X				X	
208	Laborer, Nursery	4		X				X	
209	Nursery Foreman	4				X	X	X	
210	Nursery Person	5	X			X	X	X	
211	Landscape Foreman	26				X	X	X	X
212	Laborer, Nursery	1					X	X	X
213	Site Developer	25					X	X	X
214	Nursery Worker	2			X				
215	Nursery Manager	25		X	X				
216	Landscaper	1	X	X		X	X		
217	Landscaper	4	X	X		X	X		X
218	Laborer, Landscape	1					X		
219	Landscape Foreman	3	X				X		X
220	Laborer, Landscape	1					X		X
221	Landscape, Superintendent	18					X		X
222	Laborer, Landscape	2				X			
223	Groundskeeper	2				X			
224	Tree Trimmer	6	X			X			
225	Tree Trimmer	1	X						
226	Tree Trimmer	1	X						
Total			7	10	8	9	13	13	9

[a] The mean years of experience in occupation was 6.2.

[b] The mean number of industries per respondent was 2.7.

Table F-3.--Respondents in Farm Implement Repair by Job Title and Years of Experience in Occupation.

Respondent Identification Code No.	Job Title N=17	Years of Experience in Occupation[a]
301	Farm-Equipment Mechanic	1
302	Farm-Equipment Mechanic	1
303	Farm-Machinery Set-up Man	1
304	Farm-Machinery Set-up Man	2
305	Farm-Equipment Mechanic	2
306	Manager, Farm Equipment	3
307	Farm-Equipment Mechanic	3
308	Farm-Equipment Mechanic	4
309	Farm-Equipment Mechanic/Service Manager	4
310	Farm-Equipment Mechanic	5
311	Farm-Equipment Mechanic	5
312	Farm-Equipment Mechanic	5
313	Farm-Equipment Mechanic	8
314	Farm-Equipment Parts Manager	15
315	Farm-Equipment Service Manager	15
316	Farm-Equipment Service Manager	25
317	Farm-Equipment Company Manager	26

[a] The mean years of experience in occupation was 7.4.

Table F-4--Respondents in the Biological-Technical Services in Agriculture by Job Title, Years of Experience in Occupation, and Industries in Which Engaged.

Respondent Identification Code No.	Job Title N=23	Years of Experience in Occupation[a]	Industries in Which Engaged[b]					
			Agricultural Chemical	Animal Laboratory	Food Processing	Grain/Feed/ Seed/Services	Waste Disposal	Water Resources
401	Manager, Meat Processing Plant	1			X			
402	Manager, Fruit Processing Plant	4			X			
403	Chemist, Wine	10			X			
404	Assistant Manager, Food Processing	18			X			
405	Vice President, Quality Control	37			X			
406	Sales Representative, Ag Chemicals	8	X		X		X	X
407	Manager, Fruit Processing Plant	17	X		X		X	X
408	Waste-Disposal Operator	1			X		X	X
409	Manager, Milk Processing Plant	36			X		X	
410	Sales Representative, Ag Chemicals	10	X		X	X		
411	Veterinary Assistant	3		X				
412	Veterinary Assistant	3		X				
413	Veterinary Assistant	5		X				
414	Veterinary Assistant	5		X				
415	Biologist/Ecologist	3		X			X	X
416	Lead Operator, Fertilizer Plant	1	X				X	X
417	Superintendent, Grain Elevator	18	X			X		
418	Technician, Civic Engineer	8					X	X
419	Warehouseman	1				X		
420	Operator, Feed Mill	2				X		
421	Sales Representative, Feed Company	10				X		
422	Waste-Treatment Operator	2					X	
423	Waste-Treatment Superintendent	5					X	
Total			5	5	10	5	9	6

[a] The mean years of experience in occupation was 9.0.

[b] The mean number of industries per respondent was 1.7.

APPENDIX G

PROGRAM REVIEW DATA COLLECTION INSTRUMENTS (A THROUGH E) AND COVER LETTERS

Cover Letter to Teachers of Vocational Agriculture

Who Received Only Instrument A

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES EDUCATION INSTITUTE · 410 AG HALL

August 1, 1974

Dear Teacher of Agriculture:

As you may know the College of Agriculture and Natural Resources and the College of Education are jointly conducting a research project pertaining to agriculture education. The purpose of the project is an attempt to provide a better basis for planning local programs of agribusiness and natural resources education. The three basic objectives for the research are:

1. To determine the manpower demand in agribusiness and natural resources occupations.

2. To determine, through a task analysis the competencies required for placement and advancement in agriculture related jobs.

3. To determine, through a program review, the nature of Michigan vocational education in agriculture.

We need your help on the data gathering for the review of local programs as it relates to objective number three. Your response to the enclosed questionnaire will be most beneficial in helping us accomplish this objective and consequently help in planning future vocational programs in agriculture education. If you have any questions about the instrument, please call us.

Please fill-in and return this questionnaire in the business reply envelope by August 20, 1974.

Thank you for your cooperation.

Sincerely,

Eugene E. Trotter | Boyd F. Robinson Jr.

Eugene E. Trotter
Project Director
Assistant Professor
(517) 355-6580

Boyd F. Robinson
Program Review Coordinator
331 Erickson Hall-MSU
(517) 353-9762

EET/slb

Instrument A: Comprehensive Teacher Survey Form

______________________________ NAME OF TEACHER

______________________________ NAME OF SCHOOL

AGRIBUSINESS AND NATURAL RESOURCES
EDUCATION IN MICHIGAN: PROGRAM REVIEW

> INSTRUCTIONS: Please complete the following questions as they relate to the entire vocational agriculture program in your school during the 1973-74 school year. Your answers will help us describe the nature of vocational agriculture programs across Michigan.

SECTION I

Program Components 1973-74

Please indicate which of the following program components were a part of your 1973-74 agriculture program. Check all that apply.

☐ Career Exploration Classes Middle School (7-8) Level
☐ Ninth Grade Level Vo-Ag Instruction
☐ Tenth Grade Level Vo-Ag Instruction
☐ Eleventh Grade Level Vo-Ag Instruction
☐ Twelfth Grade Level Vo-Ag Instruction
☐ Adult Farmer Instruction
☐ Young Farmer Instruction
☐ Occupational Experience Program On-Farms (9-12)
☐ Occupational Experience Program Off-Farms (9-12)
☐ FFA Chapter
☐ Summer Program
☐ Other (specify) ______________________
☐ ______________________________
☐ ______________________________

* *

SECTION II

Program Facilities 1973-74

Please indicate which of the following facilities were a part of your 1973-74 agriculture program. Check all that apply.

☐ Classroom for vocational agriculture use only
☐ Classroom shared with other teachers
☐ Office
☐ Conference Room (in addition to office)
☐ Individual study rooms or carrels
☐ Laboratory (Biology or Chemistry type)
☐ Storage Area or Room for classroom supplies and materials
☐ Land Laboratory
☐ Barns, Storage Sheds, or other Land Lab structures
☐ Farm Shop
☐ Shop Storage Room or Area for shop supplies or materials
☐ School Forest
☐ Greenhouse
☐ Nursery
☐ Other (specify) ______________________
☐ ______________________________
☐ ______________________________

* *

SECTION III

Introducing Prospective Students to Vocational Agriculture

Please indicate which of the following methods have been utilized to introduce prospective students to vocational agriculture. Check all that apply.

☐ Talks or presentations to Junior High or Middle School classes
☐ Inviting prospective students to FFA meetings
☐ Career days
☐ Interviewing prospective students
☐ Home visits
☐ Other (specify) ______________________
☐ ______________________________
☐ ______________________________

over

SECTION IV

Student Selection Criteria

Does your school use specific criteria to select students for our vocational agriculture program?

☐ YES ☐ NO If YES please complete the remainder of this section.

Please indicate which of the following criteria are actually considered when students are selected for classes in vocational agriculture. Check all that apply.

For Students Entering Ninth Grade	Student Selection Criteria	For Students Entering Eleventh Grade
☐	Demonstrated interest in agriculture.	☐
☐	Demonstrated aptitude for ag occupations.	☐
☐	Recommendation of school counselor.	☐
☐	Recommendation of school administrator.	☐
☐	Resides on a family farm.	☐
☐	Has access to facilities for an on-farm occupational experience program.	☐
☐	Results of interview with Vo-Ag teacher.	☐
☐	Approval of Parents.	☐
☐	Evidence of financial need.	☐
☐	Evidence of being socially disadvantaged.	☐
☐	Evidence of being handicapped.	☐
☐	Satisfactory school attendance record.	☐
☐	Satisfactory record of scholarship.	☐
☐	Results of OVIS or Michigan Occupational Preference Survey.	☐
☐	Has completed ag instruction at ninth and/or tenth grade level.	☐
☐	Recommendations of previous teachers.	☐
☐	Other (specify) ____________________	☐
☐	____________________	☐
☐	____________________	☐

SECTION V

COMMENTS ON QUESTIONNAIRE

Please use the space below to write any comments or explanations regarding this questionnaire. You may wish to complete the balance of the questionnaire before completing this section.

NAME OF TEACHER ________________ NAME OF SCHOOL ________________

TEACHER ASSIGNMENTS

NOTE: Each teacher of agriculture in the school should complete the teacher assignment section. Each teacher should give only information regard his or her involvement.

Please provide the following information concerning your class schedule and load for each semester during the 1973-74 school year. For each period of the day please indicate the length of the period in minutes, the number of times the class meets per week, and the nature of your assignment for that period (ie. class or course taught, such as Animal Science or Biology, planning period, cooperative education coordination, supervision of occupational experience program, study hall supervisor, etc.).

First Semester 1973-74

Period	Length in Minutes	Number of times class meets per week	Nature of Assignment (Animal Science, Biology, Study Hall, Planning, etc.)
1			
2			
3			
4			
5			
6			
7			
8			
9			

Second Semester 1973-74

Period	Length in Minutes	Number of times class meets per week	Nature of Assignment (Animal Science, Biology, Study Hall, Planning, etc.)
1			
2			
3			
4			
5			
6			
7			
8			
9			

In addition please provide the following information about your activities. Please give only information about your involvement.

Adult Classes

☐ Number of classes held per year (one class equals a series of meetings).

☐ Total number of meetings per year.

☐ Approximate total number of hours of adult instruction.

FFA Activities

☐ Approximate number of times per year that FFA activities were conducted outside of regular school day.

☐ Approximate total number of hours per year devoted to FFA activities outside of regular school day.

Occupational Experience Programs (On-Farm & Off-Farm)

☐ Approximate number of hours per year devoted to supervision of occupational experience programs (include both in-school, out-of-school, and summer hours).

Cover Letter to Teachers of Vocational Agriculture
Who Received Both Instruments A and B

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES EDUCATION INSTITUTE · 410 AG HALL

August 1, 1974

Dear Teacher of Agriculture:

Your assistance is needed with a research project underway at Michigan State University. Your response to the enclosed questionnaire will be most beneficial in providing an improved basis for planning future programs of vocational education in agriculture.

Please read the back-side of this page which explains the nature of the research project and the nature of our request to you. After reading the explanations, please complete the enclosed questionnaire and return it in the enclosed business reply envelope by August 20, 1974. If you have questions about the instrument, please call us.

Thank you for your cooperation. Your assistance will help assure that a strong basis will exist to plan future programs of vocational education in agriculture.

Sincerely,

Eugene E Trotter

Eugene E. Trotter
Project Director
Assistant Professor
(517) 355-6580

Boyd F Robinson

Boyd F. Robinson
Program Review Coordinator
331 Erickson Hall-MSU
(517) 353-9762

EET/slb

over

PLEASE READ THIS PAGE CAREFULLY BEFORE COMPLETING QUESTIONNAIRE

The College of Agriculture and Natural Resources and the College of Education are jointly conducting a research project pertaining to Agriculture Education.

The purpose of the research project is to provide an improved basis for planning local programs of Agribusiness and Natural Resources Education. The basic objectives for the research are listed below.

1. To determine the manpower demand in agribusiness and natural resources occupations.

2. To determine through a task analysis the competencies required for placement and advancement in agriculturally related jobs.

3. To determine through a program review the nature of Michigan programs of vocational education in agriculture.

It is with regard to the program review that your cooperation and assistance is needed. The information requested on the enclosed questionnaire is listed by category, below.

1. Objectives of program.
2. Description of curricula.
3. Components of programs.
4. Facilities of programs.
5. Teacher Assignments.
6. Selection of students.

To ask all teachers to provide information about all of the above categories would be both time consuming and difficult. In order to avoid such difficulties we have decided to ask a small number of questions of all teachers, and ask some teachers selected on a random basis, for additional information.

Requested information concerning local curricula is broken into program sections such as Agricultural Production, Ornamental Horticulture, etc. We have enclosed for you only the sections appropriate for your school.

The instructional areas of Agricultural Production (01.01) and Ornamental Horticulture (01.05) have been broken down into sub-areas. Please respond only to those sub-areas in which you offer instruction. The instructional area of Agricultural Mechanics (01.03) was not broken into sub-areas. Please respond to that section (if you received it) regardless of the nature of your instruction. To simplify the collection of data, the areas of Agricultural Resources (01.06) and Forestry (01.07) were combined. Please respond to that section if you offer instruction in one or both of those areas.

In some cases we may not have used the same terms that you would to describe instruction. For example, we used the term Aboriculture while you may refer to such instruction as Tree Maintenance and Care. Our main concern is to find out the nature of instruction, so if our terms do not quite match with yours please do not hesitate to complete that section.

With regard to equipment lists it should be noted that these are not exhaustive listings. If we have omitted major items that appear in your program please add those items in the space provided.

Also, you will find that Job Title listings and Student Outcome Listings are not exhaustive. Please add any items you feel should be included.

As only a small number of teachers have been asked for additional information your responses are very important. Please complete the enclosed questionnaire and return it to our office by August 20, 1974.

Instrument B: Selected District (CEPD) Survey Form

____________________________ NAME OF TEACHER

____________________________ NAME OF SCHOOL

AGRIBUSINESS AND NATURAL RESOURCES
EDUCATION IN MICHIGAN: PROGRAM REVIEW

> INSTRUCTIONS: Please complete the following sections that were a part of the entire vocational agriculture program of your school during the 1973-74 school year. Your answers will help us describe the nature of vocational agriculture programs across Michigan.

SECTION I--ANIMAL SCIENCE

Please indicate whether your school offered instruction at the ninth and/or tenth grade level in ANIMAL SCIENCE. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in ANIMAL SCIENCE designed to provide basic skills needed for entry into advanced areas of instruction at the secondary level. ☐ YES ☐ NO

Please indicate which of the following instructional sub-units were included in the ANIMAL SCIENCE instruction. Check all that apply.

☐ Swine Production
☐ Beef Production
☐ Dairy Production
☐ Broiler Production
☐ Sheep Production
☐ Horse Management
☐ Small Animals (including pets)
☐ Wildlife Management
☐ Other (specify) __________________
☐ ____________________________
☐ ____________________________

Please indicate which of the following statements were appropriate to describe the nature of the 1973-74 instructional objectives in your school for students at the ninth and/or tenth grade level. Check all statements that apply.

☐ 1. Instructional objectives for ANIMAL SCIENCE included students becoming aware of career opportunities in ANIMAL SCIENCE.

☐ 2. Instructional objectives for ANIMAL SCIENCE included student exploration of occupations in ANIMAL SCIENCE.

☐ 3. Instructional objectives for ANIMAL SCIENCE included the development of specific student knowledges in ANIMAL SCIENCE.

☐ 4. Instructional objectives for ANIMAL SCIENCE included the development of pre-vocational skills (skills of a general nature not needed for entry into a specific job or as a prerequisite to advanced instruction).

☐ 5. Instructional objectives for ANIMAL SCIENCE included the development of vocational skills (basic skills needed for entry into a specific job or as a prerequisite to advanced instruction).

* *

SECTION II--PLANT SCIENCE

Please indicate whether your school offered instruction at the ninth and/or tenth grade level in PLANT SCIENCE. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in PLANT SCIENCE designed to provide basic skills needed for entry into advanced areas of instruction at the secondary level. ☐ YES ☐ NO

Please indicate which of the following instructional sub-units were included in PLANT SCIENCE instruction. Check all that apply.

☐ Plant Identification & Classification
☐ Plant Propagation & Growth
☐ Field Crop Production
☐ Pest & Weed Control
☐ Fruit Production
☐ Home Garden Production
☐ Ornamental Production
☐ Other (specify) __________________
☐ ____________________________
☐ ____________________________

over

Please indicate which of the following statements were appropriate to describe the nature of the 1973-74 instructional objectives in your school for students at the ninth and/or tenth grade level. Check all statements that apply.

☐ 1. Instructional objectives for PLANT SCIENCE included students becoming aware of career opportunities in PLANT SCIENCE.

☐ 2. Instructional objectives for PLANT SCIENCE included student exploration of occupations in PLANT SCIENCE.

☐ 3. Instructional objectives for PLANT SCIENCE included the development of specific student knowledges in PLANT SCIENCE.

☐ 4. Instructional objectives for PLANT SCIENCE included the development of pre-vocational skills (skills of a general nature not needed for entry into a specific job or as a prerequisite to advanced instruction).

☐ 5. Instructional objectives for PLANT SCIENCE included the development of vocational skills (basic skills needed for entry into a specific job or as a prerequisite to advanced instruction).

* *

SECTION III--SOIL SCIENCE

Please indicate whether your school offered instruction at the ninth and/or tenth grade level in SOIL SCIENCE. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in SOIL SCIENCE designed to provide basic skills needed for entry into advanced areas of instruction at the secondary level. ☐ YES ☐ NO

Please indicate which of the following instructional sub-units were included in SOIL SCIENCE instruction. Check all that apply.

☐ Soils and Their Characteristics
☐ Plant Food and Its Utilization
☐ Soil and Land Evaluation
☐ Soil and Water Management
☐ Other (specify) ____________________
☐ ______________________________
☐ ______________________________

Please indicate which of the following statements were appropriate to describe the nature of the 1973-74 instructional objectives in your school for students at the ninth and/or tenth grade level. Check all statements that apply.

☐ 1. Instructional objectives for SOIL SCIENCE included student becoming aware of career opportunities in SOIL SCIENCE.

☐ 2. Instructional objectives for SOIL SCIENCE included student exploration of occupations in SOIL SCIENCE.

☐ 3. Instructional objectives for SOIL SCIENCE included the development of specific student knowledges in SOIL SCIENCE.

☐ 4. Instructional objectives for SOIL SCIENCE included the development of pre-vocational skills (skills of a general nature not needed for entry into a specific job or as a prerequisite to advanced instruction).

☐ 5. Instructional objectives for SOIL SCIENCE included the development of vocational skills (basic skills needed for entry into a specific job or as a prerequisite to advanced instruction).

* *

SECTION IV--FARM MECHANICS

Please indicate whether your school offered instruction at the ninth and/or tenth grade level in FARM MECHANICS. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in FARM MECHANICS designed to provide basic skills needed for entry into advanced areas of instruction at the secondary level. ☐ YES ☐ NO

Please indicate which of the following instructional sub-units were included in FARM MECHANICS instruction. Check all that apply.

☐ Basic Woodworking
☐ Basic Metalworking
☐ Basic Welding
☐ Small Engines
☐ Farm Electrification
☐ Other (specify) ____________
☐ ____________
☐ ____________

Please indicate which of the following statements were appropriate to describe the nature of the 1973-74 instructional objectives in your school for students at the ninth and/or tenth grade level. Check all statements that apply.

☐ 1. Instructional objectives for FARM MECHANICS included students becoming aware of career opportunities in FARM MECHANICS.

☐ 2. Instructional objectives for FARM MECHANICS included student exploration of occupations in FARM MECHANICS.

☐ 3. Instructional objectives for FARM MECHANICS included the development of specific student knowledges in FARM MECHANICS.

☐ 4. Instructional objectives for FARM MECHANICS included the development of pre-vocational skills (skills of a general nature not needed for entry into a specific job or as a prerequisite to advanced instruction).

☐ 5. Instructional objectives for FARM MECHANICS included the development of vocational skills (basic skills needed for entry into a specific job or as a prerequisite to advanced instruction).

* *

SECTION V--PERSONAL DEVELOPMENT

Please indicate whether your school offered instruction at the ninth and/or tenth grade level in the PERSONAL DEVELOPMENT area. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in PERSONAL DEVELOPMENT designed to provide basic skills needed for entry into advanced areas of instruction at the secondary level. ☐ YES ☐ NO

Please indicate which of the following statements are appropriate to describe the nature of the instructional objectives in your school for students at the ninth and/or tenth grade level. Check all statements that apply.

☐ 1. Instructional objectives for PERSONAL DEVELOPMENT included students learning to cooperate for the common good in agricultural and civic activities.

☐ 2. Instructional objectives for PERSONAL DEVELOPMENT included students development and maintaining desirable relationships between urban and rural groups.

☐ 3. Instructional objectives for PERSONAL DEVELOPMENT included students associating with and becoming a functioning member of an organization.

☐ 4. Instructional objectives for PERSONAL DEVELOPMENT included students participating in the development of local and state policies and programs affecting agriculture.

NAME OF TEACHER ______________________

NAME OF SCHOOL ______________________

AGRIBUSINESS AND NATURAL RESOURCES
EDUCATION IN MICHIGAN: PROGRAM REVIEW

INSTRUCTIONS: Please complete the following sections that were a part of the entire vocational agriculture program in your school during the 1973-74 school year. Your answers will help us describe the nature of vocational agriculture programs across Michigan.

SECTION I

01.01 Agricultural Production
ANIMAL SCIENCE

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in ANIMAL SCIENCE. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in ANIMAL SCIENCE designed to train students to enter and advance in one or more specific Job Titles (ie. Farm Operator). ☐ YES ☐ NO

Was the instructional program in ANIMAL SCIENCE designed to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level (ie. Artificial Inseminator). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in ANIMAL SCIENCE, please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Farm Operator
☐ 2. Farm Manager
☐ 3. Farm Foreman
☐ 4. Farm Laborer
☐ 5. Beekeeper
☐ 6. Part-time Farmer
☐ 7. Pet Shop Attendant
☐ 8. Veterinarians Assistant
☐ 9. Other (specify) ______________
☐ 10. ______________
☐ 11. ______________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that students should attain as a result of the ANIMAL SCIENCE instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to determine the competencies and requirements for specific careers in the ANIMAL SCIENCE area.
☐ 2. Able to follow proper procedures in locating, applying, and intervewing for a specific job.
☐ 3. Able to work cooperatively with others so as to enhance succeeding on the job.
☐ 4. Able to participate effectively in speaking and conducting business in a group or organizational meeting.
☐ 5. Able to serve effectively as an officer or member of an organization.
☐ 6. Able to select quality animals in one or more animal production areas for breeding, feeding, slaughter, etc.
☐ 7. Able to evaluate production and pedigree records for selection and breeding.
☐ 8. Able to conduct an effective breeding program in one or more animal production areas.
☐ 9. Able to develop adequate and economical livestock housing and shelter.
☐ 10. Able to compare and evaluate material handling systems.
☐ 11. Able to identify and control common farm animal diseases and parasites.
☐ 12. Able to perform common skills with livestock and poultry such as castration, debeaking, etc.
☐ 13. Able to select adequate and economical feedstuffs for livestock and poultry.
☐ 14. Able to solve common digestive and nutrient deficiency problems.
☐ 15. Able to balance animal rations that are economical and adequate.
☐ 16. Able to market one or more agricultural products efficiently and effectively.
☐ 17. Other (specify) ______________
____

over

SECTION II

01.01 Agriculatural Production
PLANT SCIENCE

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in PLANT SCIENCE. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in PLANT SCIENCE designed to train students to enter and advance in one or more specific Job Titles (ie. Farm Operator). ☐ YES ☐ NO

Was the instructional program in PLANT SCIENCE designed to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level. (ie. Plant Pathologist). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in PLANT SCIENCE, please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Farm Operator
☐ 2. Farm Manager
☐ 3. Farm Foreman
☐ 4. Farm Laborer
☐ 5. Vegetable Grower
☐ 6. Grape Grower
☐ 7. Orchard Operator
☐ 8. Custom Equipment Operator
☐ 9. Other (specify) ________________
☐ 10. ______________________________
☐ 11. ______________________________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that students should attain as a result of the PLANT SCIENCE instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to determine the competencies and requirements for specific careers in the PLANT SCIENCE area.
☐ 2. Able to follow proper procedures in locating, applying, and interviewing for a specific job.
☐ 3. Able to work cooperatively with others so as to enhance succeeding on the job.
☐ 4. Able to participate effectively in speaking and conducting business in a group or organizational meeting.
☐ 5. Able to serve effectively as an officer or member of an organization.
☐ 6. Able to select and implement appropriate tillage practices for various soil types, soil conditions, and crops.
☐ 7. Able to select and utilize proper tillage equipment for various soil types, conditions, and crops.
☐ 8. Able to select and safely operate proper planting equipment for various crops under various conditions.
☐ 9. Able to properly calibrate planting equipment.
☐ 10. Able to select and use appropriate planting procedures for various crops under various conditions.
☐ 11. Able to select appropriate fertilizers for various crops and soil conditions.
☐ 12. Able to make lime and fertilizer applications effectively.
☐ 13. Able to select and safely apply appropiate herbicides to control weeds in various crops.
☐ 14. Able to identify weeds and specify control measures.
☐ 15. Able to identify and specify control measures for common crop diseases.
☐ 16. Able to identify and specify control measures for common insects affecting crops.
☐ 17. Able to select and safely apply appropriate pesticides to control common crop insects.
☐ 18. Able to select and safely apply chemicals to control common crop diseases.
☐ 19. Able to harvest and properly store common farm crops.
☐ 20. Able to select and safely operate harvesting equipments for various farm crops.
☐ 21. Other (specify) ________________
____

SECTION III

01.01 Agricultural Production
FARM BUSINESS MANAGEMENT

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in FARM BUSINESS MANAGEMENT. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in FARM BUSINESS MANAGEMENT designed to train students to enter and advance in one or more specific Job Titles (ie. Farm Operator). ☐ YES ☐ NO

Was the instructional program in FARM BUSINESS MANAGEMENT designed to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level (ie. Grain Elevator Operator). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in FARM BUSINESS MANAGEMENT please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Farm Operator
☐ 2. Farm Manager
☐ 3. Farm Foreman
☐ 4. Farm Laborer
☐ 5. Part-time Farmer
☐ 6. Machinery Salesman
☐ 7. Other (specify) ________________
☐ 8. ________________________
☐ 9. ________________________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that students should attain as a result of the FARM BUSINESS MANAGEMENT instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to determine the competencies and requirements for specific careers in the FARM BUSINESS MANAGEMENT area.
☐ 2. Able to follow proper procedures in locating, applying, and interviewing for a specific job.
☐ 3. Able to work cooperatively with others so as to enhance succeeding on the job.
☐ 4. Able to participate effectively in speaking and conducting business in a group or organizational meeting.
☐ 5. Able to serve effectively as an officer or member of an organization.
☐ 6. Able to establish and keep accurate farm records for one or more farming enterprises.
☐ 7. Able to utilize farming records for evaluation and planning of one or more farming enterprises.
☐ 8. Able to utilize various production forecasts to plan one or more farming enterprises.
☐ 9. Able to select marketing outlets for farm products for best returns.
☐ 10. Able to select economical sources of farm equipment and supplies.
☐ 11. Able to select appropriate equipment and supplies for one or more farming enterprises.
☐ 12. Able to determine most efficient use of labor, materials, and equipment.
☐ 13. Able to operate on the futures market in one or more commodity area.
☐ 14. Able to conduct financial transactions common to a farm business.
☐ 15. Able to determine the relative advantages of loan procedures and credit arrangements.
☐ 16. Able to identify and select adequate and economical insurance coverage for farming operations.
☐ 17. Able to select appropriate types of ownership for farming operations.
☐ 18. Able to establish or complete legal transactions involving contracts, land transfers, inheritance, and similar transactions.
☐ 19. Able to file tax returns for farming operations.
☐ 20. Able to manage farm labor efficiently.
☐ 21. Other (specify) ________________
____

over

SECTION IV

01.01 Agricultural Production
FARM MECHANICS

Please indicate whether your shcool offered instruction at the eleventh and twelfth grade level in FARM MECHANICS. ☐ YES ☐ NO Complete the remainder of this page if you checked YES.

Was the instructional program in FARM MECHANICS designed to train students to enter and advance in one or more specific Job Titles (ie. Farm Operator). ☐ YES ☐ NO

Was the instructional program in FARM MECHANICS designed to provide vocational skills for occupations which may require post-secondary instruction for the student to reach entry level competence (ie. Rural Electrician). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in FARM MECHANICS, please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Farm Operator
☐ 2. Farm Manager
☐ 3. Farm Foreman
☐ 4. Farm Laborer
☐ 5. Part-time Farmer
☐ 6. Machinery Salesman
☐ 7. Custom Equipment Operator
☐ 8. Farm Equipment Operator
☐ 9. Other (specify) ____________
☐ 10. ____________
☐ 11. ____________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledge, abilities, skills, etc.) that students should attain as a result of the FARM MECHANICS instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to determine the competencies and requirements for specific careers in the FARM MECHANICS area.
☐ 2. Able to follow proper procedures in locating, applying, and interviewing for a specific job.
☐ 3. Able to work cooperatively with others so as to enhance succeeding on the job.
☐ 4. Able to participate effectively in speaking and conducting business in a group or organizational meeting.
☐ 5. Able to serve effectively as an officer or member of an organization.
☐ 6. Able to service and repair four-cycle engines.
☐ 7. Able to service and repair two-cycle engines.
☐ 8. Able to service and perform preventive maintenance on farm tractors and machinery.
☐ 9. Able to repair farm equipment and machinery effectively using an electric arc welder safely.
☐ 10. Able to repair farm equipment and machinery effectively using oxyacetylene welding equipment safely.
☐ 11. Able to calculate electrical service requirements for shop, barns, etc. to code specifications.
☐ 12. Able to perform preventive maintenance on electrical farm wiring systems and farm.
☐ 13. Able to construct farm out-buildings such as pole barns, storage sheds, etc.
☐ 14. Able to pour, finish, and cure concrete.
☐ 15. Able to maintain and safely utilize power construction tools.
☐ 16. Able to install, repair, and maintain farm plumbing systems of steel, plastic, and copper pipe.
☐ 17. Able to operate and maintain farm equipment and machinery safely.
☐ 18. Able to plan and establish a farm shop.
☐ 19. Able to select and maintain electric motors for farm uses.
☐ 20. Other (specify) ____________
____
☐ 21. ____________
____

SECTION V

AGRICULTURAL PRODUCTION EQUIPMENT LIST

INSTRUCTIONS: Please indicate which of the following items of equipment that your school has for use in the Agricultural Production program in quantities of one or more.

☐ Dehorners
☐ Vaccination Syringes
☐ Livestock Grooming Equipment
☐ Castration Equipment
☐ Soil Test Kit
☐ Soil Auger or Tube
☐ Pruning Shears & Saws
☐ Hand and/or Tank Sprayers
☐ Livestock Scales
☐ Ph Test Kit
☐ Livestock Clippers
☐ Sheep Shears
☐ Calculators or Adding Machine
☐ Planner
☐ Radial Arm Saw
☐ Tilting Arbor Saw
☐ Jointer

☐ ____________________
☐ ____________________
☐ ____________________

☐ Drill Press
☐ Portable Electric Drills
☐ Bench Grinder
☐ Power Hack Saw
☐ Portable Sander
☐ Grindstones & Wire Wheel Brush
☐ Band Saw
☐ Anvil
☐ Pipe Cutter
☐ Pipe Dies & Ratchet
☐ Oxyacetylene Welding and Cutting Unit
☐ Arc Welder with Accessories
☐ Arc Welding Tables
☐ Farm Tractor, assorted planting, tillage and harvesting equipment.
☐ Sabre Saw

☐ ____________________
☐ ____________________
☐ ____________________

☐ Paint Spray Outfit
☐ Air Compressor
☐ Electric Hoist
☐ Common hand woodworking tools
☐ Common hand metalworking tools
☐ Work Benches
☐ Tap and Die Set
☐ Soldering Equipment
☐ Assorted Screwdrivers and Wrenches
☐ Socket Wrench Set
☐ Small Engine Tool Assortment
☐ Steam Cleaner
☐ Masonry Equipment
☐ Wiring and Electrical Tools
☐ Farm Level or Transit
☐ Assorted Surveying Equipment

☐ ____________________
☐ ____________________
☐ ____________________

______________________________ NAME OF TEACHER

______________________________ NAME OF SCHOOL

AGRIBUSINESS AND NATURAL RESOURCES EDUCATION IN MICHIGAN: PROGRAM REVIEW

INSTRUCTIONS: Please complete the following sections that were a part of the entire vocational agriculture program in your school during the 1973-74 school year. Your answers will help us describe the nature of vocational agriculture programs across Michigan.

SECTION I

01.03 Agricultural Mechanics

NOTE: The instructional area of AGRICULTURAL MECHANICS is a specialized curriculum leading to employment primarily in non-production areas. When completing this page of the questionnaire do not consider FARM MECHANICS instruction given as a part of the AGRICULTURAL PRODUCTION curriculum which primarily leads to production farming jobs.

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in AGRICULTURAL MECHANICS. ☐ YES ☐ NO Complete the remainder of this page if you checked YES.

Was the instructional program in AGRICULTURAL MECHANICS designed to train students to enter and advance in one or more specific Job Titles (ie. Ag Equipment--Parts Man). ☐ YES ☐ NO

Was the instructional program in AGRICULTURAL MECHANICS designed to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level (ie. Ag Engineer Technician). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in AGRICULTURAL MECHANICS please check each of the following Job Titles for which students are trained. Check all that apply.

☐ 1. Ag Equipment Salesman
☐ 2. Ag Equipment Parts Man
☐ 3. Ag Equipment Mechanic
☐ 4. Ag Equipment Mechanics Helper
☐ 5. Ag Equipment Set-up Man
☐ 6. Farm Equipment Operator
☐ 7. Soil Conservation Aide
☐ 8. Rural Electricians Helper
☐ 9. Tractor Mechanic
☐ 10. Other (specify) ________________
☐ 11. ________________________
☐ 12. ________________________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that students should attain as a result of the AGRICULTURAL MECHANICS instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level. Check all that apply.

☐ 1. Able to order parts and supplies.
☐ 2. Able to perform sales activities related to the selling of farm machinery and/or parts effectively.
☐ 3. Able to recondition agricultural equipment including cleaning, preparation priming, and painting.
☐ 4. Able to identify and correctly price machine parts.
☐ 5. Able to complete sales invoices.
☐ 6. Able to complete inventory card correctly.
☐ 7. Able to use parts catalogs, price lists, inventory records.
☐ 8. Able to receive, check-in, and store incoming parts.
☐ 9. Able to operate and maintain hand and power metal working tools safely.
☐ 10. Able to troubleshoot and correct ignition and electrical problems in internal combustion engines.
☐ 11. Able to assemble, adjust, and lubricate agricultural equipment.
☐ 12. Able to troubleshoot and repair internal combustion engines.
☐ 13. Able to troubleshoot and repair hydraulically operated equipment.
☐ 14. Able to troubleshoot and repair the carburetors and fuel systems of gasoline fueled engines.
☐ 15. Able to troubleshoot and repair cooling systems for internal combustion engines.

over

☐ 16. Able to check and lubricate internal combustion engines, transmissions, differentials, and wheel bearings of farm tractors and machinery.

☐ 17. Able to check, adjust, and repair brake systems of farm tractors and machinery.

☐ 18. Able to adjust standard and fluid transmission systems for farm tractors and machinery.

☐ 19. Able to maintain and change the tires on farm tractors and machinery.

☐ 20. Able to operate farm tractors and other farm power machinery.

☐ 21. Able to service and perform preventive maintenance on farm tractors and machinery.

☐ 22. Able to operate, adjust, and repair common tillage equipment.

☐ 23. Able to operate, adjust, and repair common seeding equipment.

☐ 24. Able to operate, adjust, and repair common fertilizer and/or pesticide applicators.

☐ 25. Able to operate, adjust, and/or repair common cultivation equipment.

☐ 26. Able to operate, adjust, and/or repair common harvesting equipment.

☐ 27. Able to troubleshoot and repair 2-cycle and 4-cycle engines.

☐ 28. Able to perform advanced brazing, welding, and cutting skills with oxyacetylene welding equipment.

☐ 29. Able to perform advanced welding skills with arc welding equipment.

☐ 30. Able to operate and maintain hand and power tools.

☐ 31. Able to pour, finish, and cure concrete.

☐ 32. Able to cut, thread, and install steel pipe.

☐ 33. Able to install and maintain plastic pipe.

☐ 34. Able to install and maintain copper pipe.

☐ 35. Able to determine the competencies and requirements for specific careers in the AGRICULTURAL MECHANICS area.

☐ 36. Able to follow proper procedures in locating, applying, and interviewing for a specific job.

☐ 37. Able to work cooperatively with others so as to enhance succeeding on the job.

☐ 38. Able to participate effectively in speaking and conducting business in a group or organizational meeting.

☐ 39. Able to serve effectively as an officer or member of an organization.

SECTION II

AGRICULTURAL MECHANICS EQUIPMENT LIST

INSTRUCTIONS: Please indicate which of the following items of equipment that your school **has** for use in the Agricultural Mechanics program in quantities of one or **more**. Your answers will help us describe the nature of vocational agriculture programs across Michigan.

☐ Oxyacetylene Welding and Cutting Unit
☐ Gas Welding Bench
☐ Parts Cleaning Tank
☐ Live Engine Stand
☐ Impact Wrench Set
☐ Micrometer Set
☐ Alternator/Generator Regulator Tester
☐ Engine Analyzer
☐ Hydraulic Jack
☐ Power Chisel
☐ Arc Welder and Accessories
☐ Sander/Grinder Portable
☐ Overhead Reel Assemblies
☐ Steam Cleaner
☐ Drill Press
☐ Pedestal Grinder
☐ Universal Motor Stand
☐ Master Tool Set with Storage Box
☐ Welding Bench
☐ Waste Oil Dispenser
☐ Mobile Crane--Boom
☐ Tap and Die Set
☐ Air Compressor
☐ Pressure Gauge Set
☐ Compression Gauge Set
☐ Tractor Dynamometer
☐ Battery Charger Tester
☐ Spray Paint Gun with Accessories
☐ Work Benches

NAME OF TEACHER ____________________ NAME OF SCHOOL ____________________

AGRIBUSINESS AND NATURAL RESOURCES
EDUCATION IN MICHIGAN: PROGRAM REVIEW

> INSTRUCTIONS: Please complete the following sections that were a part of the entire vocational agriculture program at your school during the 1973-74 school year. Your answers will help us describe the nature of vocational agriculture programs across Michigan.

SECTION I

01.05 Ornamental Horticulture
ARBORICULTURE

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in ARBORICULTURE. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in ARBORICULTURE designed to train students to enter and advance in one or more specific Job Titles (ie. Tree Service Employee). ☐ YES ☐ NO

Was the instructional program in ARBORICULTURE designed to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level (ie. Tree Surgeon). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in ARBORICULTURE please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Arborist
☐ 2. Park Worker
☐ 3. Tree Service Worker*
☐ 4. Tree Surgeon's Assistant
☐ 5. Tree Service Owner/Operator
☐ 6. Other (specify) ____________
☐ 7. ____________
☐ 8. ____________

*Tree Service Workers includes tree pruners, budders, girdlers, planters, sprayers, removers, climbers, etc.

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that students should attain as a result of the ARBORICULTURE instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to identify the basic soil classes.
☐ 2. Able to safely apply chemicals for disease, weed, or insect control.
☐ 3. Able to identify the basic parts of plants.
☐ 4. Able to operate and maintain small gasoline engines.
☐ 5. Able to identify and select shrubs for a variety of uses.
☐ 6. Able to properly plant trees and shrubs.
☐ 7. Able to determine the competencies and requirements for specific careers in the ARBORICULTURE area.
☐ 8. Able to follow proper procedures in locating, applying, and interviewing for a specific job.
☐ 9. Able to work cooperatively with others so as to enhance succeeding on the job.
☐ 10. Able to properly select and apply fertilizers and lime to trees.
☐ 11. Able to repair injured plants.
☐ 12. Able to prune trees, shrubs, and hedges properly and effectively.
☐ 13. Able to select chemicals and spray trees for insects and diseases.
☐ 14. Able to perform tree surgery adequately and effectively.
☐ 15. Able to safely climb trees using recommended procedures.
☐ 16. Able to operate and use arboriculture tools or equipment.
☐ 17. Able to take soil samples properly.
☐ 18. Able to participate effectively in speaking and conducting business in a group or organizational meeting.
☐ 19. Able to serve effectively as an officer or member of an organization.

over

SECTION II

01.05 Ornamental Horticulture
FLORICULTURE

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in FLORICULTURE. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in FLORICULTURE designed to train students to enter and advance in one or more specific Job Titles (ie. Floral Designer). ☐ YES ☐ NO

Was the instructional program in FLORICULTURE designed to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level (ie. Greenhouse Production Manager). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in FLORICULTURE please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Wholesale Florist
☐ 2. Retail Florist
☐ 3. Flower Shop Employee
☐ 4. Flower Grower
☐ 5. Floral Designer
☐ 6. Greenhouse Employee
☐ 7. Other (specify) ________________
☐ 8. ____________________________
☐ 9. ____________________________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that students should attain as a result of the FLORICULTURE instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to safely apply chemicals for disease and insect control.
☐ 2. Able to identify the basic parts of a plant.
☐ 3. Able to operate and maintain small gasoline engines.
☐ 4. Able to water plant materials effectively.
☐ 5. Able to identify & control insects, diseases, and pests in the greenhouse.
☐ 6. Able to fertilize plant material effectively.
☐ 7. Able to select and prepare soil or growing medium for various greenhouse plants.
☐ 8. Able to effectively pot various plants.
☐ 9. Able to transplant seedlings properly.
☐ 10. Able to determine the competencies and requirements for specific careers in the FLORICULTURE area.
☐ 11. Able to follow proper procedures in locating, applying, and interviewing for a specific job.
☐ 12. Able to work cooperatively with others so as to enhance succeeding on the job.
☐ Other (specify) ________________
____
☐ 13. Able to maintain sanitary conditions in the greenhouse area.
☐ 14. Able to propagate plant material by various methods.
☐ 15. Able to control light, temperature, and moisture for optimum plant growth.
☐ 16. Able to sterilize soil using one or more sterilizing procedures.
☐ 17. Able to identify and properly utilize common growing containers.
☐ 18. Able to identify common house and greenhouse plants.
☐ 19. Able to properly regulate plant growth with chemical growth regulators.
☐ 20. Able to design floral arrangements effectively with proper consideration for the design factors of harmony, rhythm, balance, stability proportion, scale, focalization, and orientation.
☐ 21. Able to identify and select plant materials for floral arrangements.
☐ 22. Able to participate effectively in speaking and conducting business in a group or organizational meeting.
☐ 23. Able to serve effectively as an officer or member of an organization.
☐ Other (specify) ________________
____

SECTION III

01.05 Ornamental Horticulture
LANDSCAPING

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in LANDSCAPING. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in LANDSCAPING designed to train students to enter and advance in one or more specific Job Titles (ie. Landscape Gardener). ☐ YES ☐ NO

Was the instructional program in LANDSCAPING desinged to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level (ie. Landscape Architect). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in LANDSCAPING please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Landscape Draftsman
☐ 2. Landscape Contractor
☐ 3. Landscape Nurseryman
☐ 4. Cemetery or Park Laborer
☐ 5. Landscape Salesman
☐ 6. Landscape Gardener
☐ 7. Landscape Aide
☐ 8. Landscape Maintenance or Installation Foreman
☐ 9. Landscape Service Laborer
☐ 10. Other (specify) ________________
☐ 11. ______________________________
☐ 12. ______________________________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that students should attain as a result of the LANDSCAPING instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to identify basic soil classes.
☐ 2. Able to safely apply chemicals for disease, insect, and weed control.
☐ 3. Able to identify the basic parts of plants.
☐ 4. Able to operate and maintain small engines.
☐ 5. Able to maintain lawns properly.
☐ 6. Able to maintain shrubs properly.
☐ 7. Able to fertilize lawns, trees, and shrubs effectively.
☐ 8. Able to control disease and insects of trees and shrubs.
☐ 9. Able to prune trees and shrubs effectively.
☐ 10. Able to plant and maintain flower borders.
☐ 11. Able to estimate labor requirements for grounds maintenance.
☐ 12. Able to determine the competencies and requirements for specific careers in the LANDSCAPING area.
☐ 13. Able to follow proper procedures in locating, applying, and interviewing for a specific job.
☐ 14. Able to read blueprints of landscape sites.
☐ 15. Able to lay-out a landscape plan.
☐ 16. Able to determine drainage needs of a landscape site.
☐ 17. Able to take soil samples properly.
☐ 18. Able to determine lime and fertilizer needs for a landscape site.
☐ 19. Able to transplant trees and shrubs.
☐ 20. Able to seed & establish lawns properly.
☐ 21 Able to select watering equipment for a landscape site.
☐ 22. Able to determine water needs of a landscape site.
☐ 23. Able to operate and maintain landscaping tools and equipment properly.
☐ 24. Able to work cooperatively with others so as to enhance succeeding on the job.
☐ 25. Able to participate effectively in speaking and conducting business in a group or organizational meeting.
☐ 26. Able to serve effectively as an officer or member of an organization.

over

SECTION IV

01.05 Ornamental Horticulture
GREENHOUSE OPERATION & MANAGEMENT

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in GREENHOUSE OPERATION & MANAGEMENT. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in GREENHOUSE OPERATION & MANAGEMENT designed to train students to enter and advance in one or more specific Job Titles (ie. Greenhouse Employee). ☐ YES ☐ NO

Was the instructional program in GREENHOUSE OPERATION & MANAGEMENT designed to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level (ie. Plant Geneticist). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in GREENHOUSE OPERATION & MANAGEMENT please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Greenhouse Employee
☐ 2. Plant Propagator
☐ 3. Flower Grower
☐ 4. Greenhouse Manager
☐ 5. Garden Center Employee
☐ 6. Other (specify) ________
☐ 7. ________
☐ 8. ________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that students should attain as a result of the GREENHOUSE OPERATION & MANAGEMENT instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to safely apply chemicals for disease and insect control.
☐ 2. Able to identify the basic parts of a plant.
☐ 3. Able to operate and maintain small gasoline engines.
☐ 4. Able to water plant materials effectively.
☐ 5. Able to identify control insects, diseases, and pests in the greenhouse.
☐ 6. Able to fertilize plant material effectively.
☐ 7. Able to select and prepare soil or growing medium for various greenhouse plants.
☐ 8. Able to effectively pot various plants.
☐ 9. Able to transplant seedlings.
☐ 10. Able to determine the competencies and requirements for specific careers in the GREENHOUSE OPERATION & MANAGEMENT area.
☐ 11. Able to follow proper procedures in locating, applying, and interviewing for a specific job.
☐ 12. Able to work cooperatively with others so as to enhance succeeding on the job.
☐ 13. Able to maintain sanitary conditions in the greenhouse area.
☐ 14. Able to propagate plant material by various methods.
☐ 15. Able to control light, temperature, and moisture for optimum plant growth.
☐ 16. Able to sterilize soil using one or more sterilizing procedures.
☐ 17. Able to identify and properly utilize common growing containers.
☐ 18. Able to identify common house and greenhouse plants.
☐ 19. Able to properly regulate plant growth with chemical growth regulators.
☐ 20. Able to prepare nursery stock for display.
☐ 21. Able to participate effectively in speaking and conducting business in a group or organizational meeting.
☐ 22. Able to serve effectively as an officer or member of an organization.
☐ 23. Other (specify) ________
____
☐ 24. ________
____

SECTION V

01.05 Ornamental Horticulture
NURSERY OPERATION & MANAGEMENT

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in NURSERY OPERATION & MANAGEMENT. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in NURSERY OPERATION & MANAGEMENT designed to train students to enter and advance in one or more specific Job Titles (ie. Nursery Worker). ☐ YES ☐ NO

Was the instructional program in NURSERY OPERATION & MANAGEMENT designed to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level (ie. Plant Pathologist). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in NURSERY OPERATION & MANAGEMENT please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Nurseryman
☐ 2. Nursery Manager
☐ 3. Nursery Foreman
☐ 4. Nursery Salesman
☐ 5. Nursery Worker
☐ 6. Nursery Grower
☐ 7. Other (specify) ________________
☐ 8. ________________
☐ 9. ________________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that students should attain as a result of the NURSERY OPERATIONS & MANAGEMENT instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to identify basic soil classes.
☐ 2. Able to safely apply chemicals for disease, insects, and weed control.
☐ 3. Able to identify the basic parts of plants.
☐ 4. Able to operate and maintain small engines.
☐ 5. Able to identify, select, and plant nursery stock.
☐ 6. Able to prune and shape nursery stock.
☐ 7. Able to select nursery stock for various uses.
☐ 8. Able to estimate relative quality of nursery stock.
☐ 9. Able to suggest species and varieties to meet customer needs.
☐ 10. Able to operate and maintain nursery and garden equipment.
☐ 11. Able to determine the competencies and requirements for specific careers in the NURSERY OPERATION & MANAGEMENT area.
☐ 12. Able to follow proper procedures in locating, applying, and interviewing for a specific job.
☐ 13. Able to work cooperatively with others so as to enhance succeeding on the job.
☐ 14. Able to perform sales activities related to the selling of nursery stock and garden equipment.
☐ 15. Able to identify and control common diseases, insects, and weeds found in nursery stock.
☐ 16. Able to identify and select materials used for planting media.
☐ 17. Able to sterilize planting media using one or more methods.
☐ 18. Able to prepare shrubs for transplanting.
☐ 19. Able to propagate nursery stock by various methods.
☐ 20. Able to select and apply fertilizers for nursery crops.
☐ 21. Able to identify and select proper methods of weed control for nursery crops.
☐ 22. Able to identify and select proper methods of disease control in nursery crops.
☐ 23. Able to prepare nursery stock for display.
☐ 24. Able to participate effectively in speaking and conducting business in a group or organizational meeting.
☐ 25. Able to serve effectively as an officer or member of an organization.
☐ 26. Other (specify) ________________
____

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SECTION VI

01.05 Ornamental Horticulture
TURF MANAGEMENT

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in TURF MANAGEMENT. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in TURF MANAGEMENT designed to train students to enter and advance in one or more Job Titles (ie. Groundskeeper). ☐ YES ☐ NO

Was the instructional program in TURF MANAGEMENT designed to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level (ie. Golf Course Manager). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in TURF MANAGEMENT please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Turf Production Manager
☐ 2. Groundskeeper
☐ 3. Park or Golf Course Foreman
☐ 4. Golf Course Laborer
☐ 5. Sod Service Worker
☐ 6. Sod Salesman
☐ 7. Greenskeeper
☐ 8. Other (specify) ____________
☐ 9. ____________
☐ 10. ____________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that students should attain as a result of the TURF MANAGEMENT instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to identify basic soil classes.
☐ 2. Able to safely apply chemicals for disease, pest, and weed control.
☐ 3. Able to identify the basic parts of a plant.
☐ 4. Able to operate and maintain small engine.
☐ 5. Able to prepare a turf seed bed.
☐ 6. Able to seed and establish a turf site.
☐ 7. Able to lay sod for a turf site.
☐ 8. Able to establish a turf area using stolons.
☐ 9. Able to select and apply fertilizer to an establish lawn or turf site.
☐ 10. Able to identify and control common weeds in an established lawn or turf. site.
☐ 11. Able to determine the competencies and requirements for specific careers in the TURF MANAGEMENT area.
☐ 12. Able to follow proper procedures in locating, applying, and interviewing for a specific job.
☐ 13. Able to work cooperatively with others so as to enhance succeeding on the job.
☐ 14. Able to identify and control common diseases in lawn grasses or other turf areas.
☐ 15. Able to mow, maintain, and water an established lawn or other turf area.
☐ 16. Able to identify and select turf grasses for a golf course, lawn, park, or recreational area.
☐ 17. Able to determine drainage problems at a turf site.
☐ 18. Able to take a soil sample.
☐ 19. Able to determine amount of water needed in a turf area.
☐ 20. Able to determine the needed frequency of watering a turf area.
☐ 21. Able to identify and apply control measures for animal pests in a turf area.
☐ 22. Able to renovate older established turf areas.
☐ 23. Able to operate and maintain turf equipment and tools.
☐ 24. Able to participate effectively in speaking and conducting business in a group or organizational meeting.
☐ 25. Able to serve effectively as an officer or member of an organization.
☐ 26. Other (specify) ____________
____

SECTION VII

HORTICULTURE EQUIPMENT LIST

INSTRUCTION: Please indicate which of the following items of equipment that your school has for use in the Horticulture Program in quantities of one or more.

☐ Typewriter with Table
☐ Socket Wrench Set
☐ Drill Press
☐ Steam Cleaner
☐ Dwell-Tachometer
☐ Small Engine Tool Assortment
☐ Battery Tester & Charger
☐ Crane, Boom Type
☐ Impact Wrenches 1/2"
☐ Air Compressor
☐ Table Saw
☐ Workbenches
☐ Machinists Vises
☐ Pedestal Grinder
☐ Small Engine Analyzer
☐ ____________________
☐ ____________________
☐ ____________________

☐ Electric Drills 3/8"
☐ Lubrication Tool Assortment
☐ Hydraulic Jack
☐ Arbor Press
☐ Tap and Die Set
☐ Dump Cart
☐ Cultivator
☐ Single Disc Harrow
☐ Power Sprayer
☐ Garden Tractor with Accessories
☐ Rototiller
☐ Soil Test Kit, student
☐ Compost Grinder
☐ Black Shade Cloth
☐ Automatic Watering System
☐ ____________________
☐ ____________________
☐ ____________________

☐ Ph Meter
☐ Sink/Counter Unit
☐ Protective Gear for Pesticide application
☐ Handtool Set Storage Center
☐ Scarifier
☐ Hedge Trimmer
☐ Lawn Mowers--Reel & Rotary Power
☐ Soil Sterilizer
☐ Soil Test Kit, Professional
☐ Plant Benches
☐ Mist System
☐ Solubridge
☐ Work Tables
☐ Floral Refrigerator
☐ Heating Cable with Thermostat
☐ ____________________
☐ ____________________

NAME OF TEACHER ____________________ NAME OF SCHOOL ____________________

AGRIBUSINESS AND NATURAL RESOURCES
EDUCATION IN MICHIGAN: PROGRAM REVIEW

INSTRUCTIONS: Please complete the following sections that were a part of your entire vocational agriculture program at your school during the 1973-74 school year. Your answers will help us describe the nature of vocational agriculture programs across Michigan.

SECTION I

01.06 Agricultural Resources and/or 01.07 Forestry

Please indicate whether your school offered instruction at the eleventh and twelfth grade level in AGRICULTURAL RESOURCES AND/OR FORESTRY. ☐ YES ☐ NO Complete the remainder of this section if you checked YES.

Was the instructional program in AGRICULTURAL RESOURCES AND/OR FORESTRY designed to train students to enter and advance in one or more specific Job Titles (ie. Park Worker). ☐ YES ☐ NO

Was the instructional program in AGRICULTURAL RESOURCES AND/OR FORESTRY designed to provide vocational skills for occupations which may require additional post-secondary instruction for the student to reach entry level (ie. Soil Conservation Technician, Game Warden). ☐ YES ☐ NO

If your school offered instruction leading to specific Job Titles at the eleventh and twelfth grade level in AGRICULTURAL RESOURCES AND/OR FORESTRY please check each of the following Job Titles for which students were trained. Check all that apply.

☐ 1. Conservation Aide
☐ 2. Forest Worker
☐ 3. Park Worker
☐ 4. Game Farm Worker
☐ 5. Fish Hatchery Worker
☐ 6. Animal Caretaker
☐ 7. Logger
☐ 8. Tree Service Worker
☐ 9. Forest Aide
☐ 10. Other (specify) ____________
☐ 11. ____________
☐ 12. ____________

Desired Student Outcomes

Please indicate which of the following student outcomes (knowledges, abilities, skills, etc.) that student should attain as a result of the AGRICULTURAL RESOURCES AND/OR FORESTRY instruction at the eleventh and twelfth grade level. Do not check an outcome that students would normally attain at the ninth and tenth grade level.

☐ 1. Able to make a soil separates test to determine soil texture.
☐ 2. Able to determine soil texture by feel.
☐ 3. Able to identify soil classes.
☐ 4. Able to determine physical, chemical, and biological properties of soil.
☐ 5. Able to take soil samples and implement soil test recommendations.
☐ 6. Able to specify the land use or uses for a given area of land.
☐ 7. Able to identify proper land use practices for a given area of land.
☐ 8. Able to measure land effectively by various methods.
☐ 9. Able to read soil maps and aerial photos.
☐ 10. Able to perform elementary surveying using one or more methods (differential leveling, profile leveling, and topographic surveying).
☐ 11. Able to identify causes and sources of pollution for a given lake or stream.
☐ 12. Able to specify conservation practices and correct common water pollution problems.
☐ 13. Able to collect water samples and conduct various water tests.
☐ 14. Able to identify sources and causes of air pollution.
☐ 15. Able to identify food sources for common mammals and birds.
☐ 16. Able to determine fish populations in lakes, rivers, and streams.

over

☐ 17. Able to detect and make recommendations for correcting fish balance.

☐ 18. Able to evaluate the need for and select species for stocking farm ponds and lakes.

☐ 19. Able to control waterweeds and algae in farm ponds and lakes.

☐ 20. Able to fertilize farm ponds and lakes to improve fish production.

☐ 21. Able to identify native wildlife and gamebirds.

☐ 22. Able to identify food sources for common mammals and birds.

☐ 23. Able to conduct wildlife population and habitat surveys.

☐ 24. Able to make recommendations for the management of wildlife populations.

☐ 25. Able to use a compass to determine direction and follow a prescribed course.

☐ 26. Able to use a transit to lay-out a camp site.

☐ 27. Able to select a route and construct a nature trail for hiking and/or horseback riding and/or all-terrain vehicles.

☐ 28. Able to identify available surface water ina given land area.

☐ 29. Able to estimate water demands for a given community.

☐ 30. Able to identify and implement common irrigation methods.

☐ 31. Able to safely operate and maintain chain saws.

☐ 32. Able to use forest and/or conservation tools properly.

☐ 33. Able to administer first-aid for minor injuries.

☐ 34. Able to operate and maintain small gasoline engines.

☐ 35. Able to select and apply pesticides for the control of common insects and pests in recreational areas.

☐ 36. Able to identify common trees given a leaf, bud, seed, or complete tree.

☐ 37. Able to plant pine seedlings properly.

☐ 38. Able to plan and implement a reforestation plan.

☐ 39. Able to weed, prune, and thin an established forest.

☐ 40. Able to identify insects, diseases, and pests common to forest areas.

☐ 41. Able to select and implement control measures for forest diseases, insects, and pests.

☐ 42. Able to apply chemicals used in controlling forest diseases, insects, and pests safely.

☐ 43. Able to measure forest products accurately.

☐ 44. Able to determine species, age, or history of a standing tree.

☐ 45. Able to cruise timber stands properly and accurately.

☐ 46. Able to estimate the value of a timber stand accurately.

☐ 47. Able to select and mark trees for harvesting.

☐ 48. Able to determine the competencies and requirements for specific careers in the AGRICULTURAL RESOURCES AND FORESTRY area.

☐ 49. Able to follow proper procedures in locating, applying, and interviewing for a specific job.

☐ 50. Able to work cooperatively with others so as to enhance succeeding on the job.

☐ 51. Able to participate effectively in speaking and conducting business in a group or organizational meeting.

☐ 52. Able to serve effectively as an officer or member of an organization.

☐ 53. Other (specify) ____________________

____

☐ 54. ____________________

____

SECTION II

AGRICULTURAL RESOURCES AND/OR FORESTRY EQUIPMENT LIST

INSTRUCTIONS: Please indicate which of the following items of equipment that your school has for use in the AGRICULTURAL RESOURCES AND/OR FORESTRY program.

☐ Farm Levels and/or Transits
☐ Live Animal Traps and Cages
☐ Hand Axes
☐ Block and Tackle
☐ Adding Machine and/or Calculator
☐ Camera
☐ Log Handling Tools
☐ Chain Saws
☐ Surveying Tools
☐ Assorted Tree Saws
☐ Cruiser Sticks
☐ Depth Meter
☐ Assorted Measurement Devices
☐ Drafting and Drawing Equipment
☐ ____________________
☐ ____________________
☐ ____________________
☐ ____________________
☐ ____________________

☐ Hand Compasses
☐ Hand Levels
☐ Hard Hats
☐ Assorted Hoes, Rakes, Shovels, and Posthole Diggers
☐ Insect Collection and Preservation Equipment
☐ Microscopes
☐ Assorted Pruning Equipment
☐ Soil Auger
☐ Soil Moisture Meter
☐ Soil Ph Test Kit
☐ Soil Probes
☐ Assorted Sprayers
☐ Tractor with Assorted Implements
☐ Tree Climbing Equipment
☐ ____________________
☐ ____________________
☐ ____________________
☐ ____________________

☐ Tree Planting Equipment
☐ Tree Marking Guns
☐ Water Testing Kits
☐ Assorted Carpentry Tools
☐ Assorted hand tools for engine and equipment maintenance.
☐ Electric arc welder and accessories
☐ Oxyacetylene Torch and accessories
☐ Assorted Power Saws, Drills, and Grinders
☐ Assorted Safety Equipment
☐ Assorted Chains
☐ Tree Injector
☐ Assorted Equipment for collecting and cooking Maple Syrup
☐ Aerial Photo interpretation grids
☐ Topographic Maps

Instrument C: Form Used to Record Data from Michigan Department of Education Official Records

SCHOOL NAME ____

SCHOOL CODE ________________________ SIZE CODE __________

SCHOOL ENROLLMENT CEPD NO. __________

K - 12 ____________________________ SMSA NO. __________

9 - 12 ____________________________ COMMUNITY TYPE ________

REIMBURSED PROGRAM:

01.01 Agri. Prod. ______________________________

01.02 Agri. Supplies ___________________________

01.03 Agri. Mech. ______________________________

01.04 Agri. Products ___________________________

01.05 Ornamental Horticulture __________________

01.06 Agri. Resources __________________________

01.07 Ag Coop ________________________________

Instrument D: Form Used to Record Student Occupational Training Pattern Data

Student's Name or Number ______________________

No. of Semesters in Vo-Ag ______________________

Year	Course Title	1st Sem.	Course Title	2nd Sem.
1969-70				
1970-71				
1971-72				
1972-73				

Code for Non-Vo-Ag Instruction

01 Prod Ag
02 Ag Supplies
03 Ag Mech
04 Ag Prod
05 Orn Hort
06 Ag Resources
07 Forestry
08 Coop (Ag)
09 Other Ag
11 Other Reimbursed Vo Course
12 Other Academic Course
13 Coop Ed (Non Vo-Ag)
14 Voc Related Course
15 Student Dropped
16 Student Transferred
17 Student Deceased
18 Expulsion, Student did not graduate, etc.
19 Course not available
21 Forestry & Ag Coop
22 Prod Ag & Ag Coop
23 Prod Ag & Forestry
24 2 classes of Hort
25 2 classes of Prod Ag
26 Forestry, Ag Coop & Prod Ag
27 An Sci, Ag Coop & Prod Ag

Student Name: ______________________

____

____

____

____

Date

Cover Letter to Graduates in Follow-Up Sample

MICHIGAN STATE UNIVERSITY

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES
EDUCATION INSTITUTE · AGRICULTURE HALL

EAST LANSING · MICHIGAN · 48824

November 4, 1974

Dear Former Student:

We at ________________________________ are proud of our vocational agriculture program and we are always looking for ways to improve it. As such, we are pleased to cooperate with researchers at Michigan State University in obtaining information which will help to plan better programs of vocational agriculture.

As a former student who took vocational agriculture at _______________, you can be of help to us in our efforts to improve. By taking a few moments of your time to complete the enclosed survey, you can help us to better serve present and future students of vocational agriculture.

Former students from other high schools around the state will also be replying to this survey. So, your response will help to build stronger programs of vocational agriculture all over Michigan as well as here at ______________________________.

Please complete the brief questionnaire and return it in the self-addressed business reply envelope (no postage necessary) as soon as possible.

Thank you for your help in this matter.

Sincerely,

Encl.

MSU/ANREI
11 - 1 - 74

Instrument E: Graduate Follow-Up Survey Form

VOCATIONAL AGRICULTURE
FORMER STUDENT SURVEY

____
NAME

____
SCHOOL

Marital Status
______ Single
______ Married
______ Other
(Divorced, etc.)

Sex
______ Female
______ Male

ADDITIONAL TRAINING OR EDUCATION

1. Since attending high school what further education or training have you received?

______ None
______ Employer sponsored on-the-job training
______ Apprenticeship Training
______ Specialized military training
______ Private Technical Institutes
______ Public School Training (Adult Education)
______ Community College
______ University or college
______ Other, Specify________________________
____

2. Are you currently enrolled in an educational program in one of the areas listed in question 1?

____ YES ____ NO ____ DOES NOT APPLY

3. Does your additional training or education beyond high school relate to the field of agriculture?

____ YES ____ NO ____ DOES NOT APPLY

4. If additional training beyond high school is related to agriculture which of the following is it most related to? (CHECK ONLY ONE)

______1. Production Agriculture (farming, etc.)
______2. Agri. Supplies & Services (equpt. sales)
______3. Agri. Mechanics (equpt. repair, etc.)
______4. Agri. Products (processed fruits, etc.)
______5. Ornamental Hort. (landscaping, etc.)
______6. Agri. Resources (conservation, etc.)
______7. Forestry (forest maintenance, etc.)
______8. Other (specify) ________________

EMPLOYMENT STATUS

1. What is your current employment status?

______ Employed
______ Unemployed & seeking employment
______ Unemployed & not seeking employment
______ Unavailable for employment (illness, military, school, etc.)

2. How long have you been in the employment (or unemployment) status checked in question 1?

______ Less than one month
______ From one to six months
______ From six to twelve months
______ More than one year

ABOUT YOUR EMPLOYMENT

1. Have you held a job since high school graduation that relates to the area of agriculture?

____ YES ____ NO

2. Are you currently employed in a job relating to agriculture?

____ YES ____ NO

3. If you have held a job relating to agriculture, is or was the job a:

______ Part-time job
______ Full-time job (more than 35 hours per week)

4. Do you feel that more training would have helped you in your agriculturally related job?

____ YES ____ NO ____ DOES NOT APPLY

5. If you have held a job related to agriculture since graduation, which of the following is or was it most related to:

________1. Production Agriculture (farming, etc.)
________2. Agri. Supplies & Services (equpt. sales)
________3. Agri. Mechanics (equpt. repair, etc.)
________4. Agri. Products (processed fruits, etc.)
________5. Ornamental Hort. (landscaping, etc.)
________6. Agri. Resources (conservation, etc.)
________7. Forestry (forest maintenance, etc.)
________8. Other (specify) ________________

APPENDIX H

MICHIGAN OCCUPATIONAL PREFERENCE SURVEY IN AGRICULTURE (MOPSA): SURVEY INSTRUMENT, DIRECTIONS FOR ADMINISTERING, SCALE DESCRIPTIONS, AND STUDENT AND LOCAL SCHOOL REPORTS

Directions for administering the Preference Survey Form*

Most young persons need help in deciding what they will do in the adult world. I do not mean that some one should tell you what to do, but that one should help you decide what you want to do. This check list entitled "Occupation Preference Survey" is composed of work activities from agricultural occupations. There are 98 different activities; fourteen items are for each of seven agricultural occupation groups. The agricultural occupation groups are classified as agricultural production, agricultural mechanics, agricultural business, ornamental horticulture, forestry, conservation and wildlife.

The purpose of this inventory is to determine which group or groups of the agricultural occupations you like to do. You are asked to select one of the five descriptive statements to indicate how well you like to do each of the 98 activities listed. Your answers must be recorded on the answer sheet provided you. Your completed answer sheet can be mechanically scored and recorded on a sheet containing your name. You may never have used an answer sheet like this before, so we must teach you how to use it.

First we need to have you record your name. There are ten spaces for the letters of your last name and six spaces for letters of your first name. If you have more letters in either your first or last name, you will have to abbreviate whichever is too long. Begin by printing with a No. 2 (soft lead) pencil each letter of your names in the boxes provided in the upper right corner of the long side of the sheet. Then shade in the spaces between brackets for the letters below in the appropiate columns. Be sure that pencil marks do not extend beyond the rectangle formed by the brackets. Look at your marks and if any marks extend out of bounds either longer or wider than the rectangle, erase them. The month and day and your sex should be recorded below.

At the top of the inventory list you will see the five descriptive statements that you will use in recording how much you like to do the activity. In addition there are three examples that you can use for practice. Find 101, 102, 103 on the answer sheet and use these to record your answers for the three examples. Shade the number that describes how much you like to "Take care of new born animals" in 101. If you have never done this, but have seen a person do it and believe you can decide if you would or would not like to do it, mark it either "1", "2", "4", "5". Do not mark an item "3" unless you feel very "uncertain" about it. Continue with the other two examples "Clean manure from the barns" and "Pick fruit for market" and mark them as you like to do this work or think you would like to do it in answer spaces for 102 and 103.

If you understand what you have done and have no questions, you should be ready to mark your responses to each of the 98 activities listed on Occupation Preference Survey Form. Be sure that the shading completely covers the area partially enscribed in the rectangular area - 2. It is important that no lines or marks extend beyond the boundaries established by brackets above and below the number.

---

*Developed by H. Paul Sweany.

OCCUPATION PREFERENCE SURVEY *
(Second Form)

Directions: The different items listed below are kinds of work which persons in agricultural occupations have to do to be successful. You may have done many of these. For all items listed indicate if you enjoy doing this work by shading the number of your choice on the answer sheet.

1 = like to do very much(love to do) Take care of new born animals 1 2 3 4 5
2 = like to do
3 = uncertain Clean manure from the barns 1 2 3 4 5
4 = dislike to do
5 = dislike to do very much(hate to do) Pick fruit for market 1 2 3 4 5

* Do not check as "uncertain" work you have never done if you have seen others do it and can decide.

1. Use mechanical equipment
2. Feed animals or pets
3. Mow a lawn
4. Sell products to customers in stores
5. Identify trees
6. Make topographical maps
7. Stock streams and ponds with fish
8. Take an order over the phone
9. Identify soil types
10. Plant tree seedlings
11. Clean, grease and oil machinery
12. Raise and care for young farm animals
13. Plant trees and shrubs
14. Provide homes for birds and wildlife
15. Repair broken things
16. Operate a chain saw
17. Check field crops for proper growth
18. Recognize and make plans for problem fields
19. Arrange flowers
20. Use a cash register
21. Identify birds and wild animals
22. Collect water samples for testing
23. Fell, trim, peel logs and pulpwood
24. Obey and defend hunting and fishing laws
25. Demonstrate how to use a product
26. Weed flower beds
27. Grow field crops
28. Make moving things run smoothly
29. Operate farm machinery
30. Determine best uses of land
31. Attach motor to push mowers or tools
32. Study life of different forest areas
33. Fill out a sales slip
34. Climb and prune trees
35. Reproduce plants from stems or leaves
36. Work behind a counter
37. Identify pollution sources
38. Reforest an area
39. Construct things
40. Milk cows
41. Transplant flowers in a border
42. Collect wildlife for study of life habits
43. Help people understand pollution
44. Brush animals to improve appearance
45. Make improvements for machines
46. Study wild animals and birds
47. Pot seedlings
48. Work in woods in all types of weather
49. Replace goods on shelves in stores
50. Make Christmas wreaths
51. Take things apart to see how they work
52. Keep growth records of animals
53. Determine affects of environment on wildlife
54. Determine the value of items
55. Take long hikes in the woods
56. Identify disease and pests of the environment
57. Cruise forests to determine useful trees
58. Make labor-saving devices
59. Release game birds and animals for hunting
60. Own farm animals
61. Write a business letter
62. Study effects of pollution on communities
63. Work in a greenhouse
64. Sell timber, pulpwood, and Christmas trees
65. Determine best uses of natural resources
66. Own hand tools
67. Wrap a package
68. Study relationships between plants and animals
69. Grow plants in pots
70. Do chores
71. Maintain homes for birds and animal life
72. Study and make plans to improve environment
73. Build nature trails
74. Order merchandise from a catalog
75. Choose plants for a flower garden
76. Harvest grain and forage crops
77. Adjust small machines
78. Plow fields in Spring
79. Take counts of game animals
80. Adjust machines for better operations
81. Clean pollution from streams
82. Arrange articles for sale in storewindows
83. Graft trees
84. Watch logs being sawed into lumber
85. Train roses on a fence
86. Trim trees for harvest
87. Deliver goods to a customer
88. Plan rations for farm animals
89. Raise pheasants to release
90. Study natural life over a long period
91. Service machines
92. Trap wild animals for hides
93. Operate an adding machine
94. Replace broken parts
95. Keep farm records
96. Tap trees for maple syrup production
97. Clean leaves of house plants
98. Use a compass

---

*Developed by H. Paul Sweany.

Letter to Cooperating Schools

MICHIGAN STATE UNIVERSITY

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES
EDUCATION INSTITUTE · AGRICULTURE HALL

EAST LANSING · MICHIGAN · 48824

Enclosed are the results of the Michigan Occupational Preference Survey in Agriculture (MPOSA) taken by your students last November. The results are contained in three packages labeled (1) Student Reports, (2) Summary for Vo-Ag Teacher, and (3) Summary for School Counselors. You may wish to discuss your student's MOPSA results with the school counselor when you give him or her the counselor package.

I must extend my personal apology for the extreme delay in returning the MOPSA results to you. After administering the preference survey to your students, it was decided that students and schools that participated in the study deserved more than a simple report of raw scores. With that in mind we developed a computer generated Student Report and Local School Report which has taken substantial time. We do hope that the improvements in the reporting system were worth the wait for both you and your students.

The materials enclosed in the teacher and counselor package should provide you with any information you may need. If you or your counselor have questions, please do not hesitate to call either myself or Dr. William Thuemmel at the number below.

I would like to take this opportunity to thank you personally for your willingness to assist us with obtaining student interest data for the research project. We are currently analyzing student interest as well as other data from the project.

Again, thanks for your cooperation. If I may be of service, please call on me.

Sincerely,

Boyd F. Robinson, Jr.

Boyd F. Robinson, Jr.
Program Review Coordinator
Agribusiness and Natural Resources Education
  Research Project
Telephone: (517) 355-6580

MICHIGAN OCCUPATIONAL PREFERENCE SURVEY IN AGRICULTURE

INFORMATION FOR TEACHERS AND COUNSELORS*

INTRODUCTION - The purpose of the Michigan Occupational Preference Survey in Agriculture is to provide a means by which a student's interest in seven occupational groups within the broad field of agriculture may be ascertained. The interest inventory has value to students in assisting them with career and educational decisions. The survey may also have value to teachers and administrators in planning vocational programs in agriculture.

This packet of materials contains several items to assist you in your work with students. Among the items enclosed are (1) A sample copy of the Student Report and the Interpretation of Student Report, (2) the Local School Report composed of the reference group parameters and range of raw scores, a summary of student scale scores, and percentile rankings by scale and raw score for the reference group, (3) a reprint from the Service Letter entitled "Research-Dissemination-Utilization: Determining Student Interest in Agriculture", and (4) a sample copy of the interest inventory along with the directions for administering the inventory and a scoring sheet.

The Interpretation of the Student Report should give you any information you may need on the Student Report. With the exception of the Local School Report which is explained below you should find the other enclosures to be self-explanatory.

NATURE OF THE PREFERENCE SURVEY - The Michigan Occupational Preference Survey in Agriculture was developed by Dr. H. Paul Sweany at Michigan State University. The survey has been revised and administered to numerous agriculture students in Michigan. To a degree the interest inventory has been standardized. Even so, in order to be "standardized" in the truest sense of the word the survey needs additional refinement and testing to further establish reliability and validity. Further, the survey should be administered to additional numbers of students to establish norms for a wider range of student groups. As with any standardized test, some caution should be exercised in the interpretation and utilization of the scale scores. With appropriate use the survey can be a valuable tool for students, teachers, counselors, and administrators.

OVERVIEW OF THE LOCAL SCHOOL REPORT - The first section of the Local School Report gives the total number of local students tested as well as a breakdown by grade level. The scales of the inventory are listed by name and number, reference group parameters (median, mean, and standard deviation) are given for each scale, and the range of raw scores by interest category and by scale are presented for the reference group. The second section of the report gives a summary of all the local student's raw scores for each of the scales along with the category within which each raw score falls. The third section is a listing of percentile ranks for each possible raw score by scale.

In the first section the category of "other" for the number of students tested by grade level was reserved for students whose grade level was unknown. As is reported elsewhere, the reference group consisted of 140 Michigan Tenth Graders enrolled in Vocational Agriculture. The students were from five schools participating in the Agribusiness and Natural Resources Education Curriculum Research Project conducted by Michigan State University. Your school was one of the five and your tenth grade students listed in section two of the report were included in the reference group. However, local students at other grade levels listed in section two were not included in the reference group. The possible range for a students score on any of the seven scales was from a plus 28 to a minus 28.

It should be pointed out that the range of raw scores by scale and by category reported on page one was constructed in a special fashion. The following two paragraphs dealing with the range of raw scores are technical in nature. Teachers who have questions regarding the following comments may wish to check with counselors for clarification.

While the range for all scales approximated a normal distribution, the range of raw scores was reported on the basis of a rectangular distribution. The scores were reported in that manner to avoid having a large percentage of students fall into Category C "Uncertain" which would occur if the scores were reported on the basis of a normal distribution. Reporting on the basis of a rectangular distribution provides that for each scale twenty percent of the reference group will fall into each of the five categories. (i.e. Like to very much, Like to do, etc.)

Consequently, some caution should be exercised in accepting the category within which a given students score falls on a particular scale. This is particularly true for scores falling into the "Dislike to do very much" category. For example, the dislike to do very much category for the production agriculture scale (Scale 6), has a range of minus 28 to plus 3. It may be inaccurate to say that a student scoring plus 3 on that scale would actually dislike to do a production agriculture type job very much. As you will note, the range for other categories is substantially smaller. Consequently, less problems with interpretation should be encountered with these categories.

Section three of the Local School Report is a table of percentile ranks for the reference group. You may use the table to determine the percentile rank of any students raw score found in Section Two for any of the seven scales. Through an oversight the percentile ranks were reported on a decimal bais. Please ignore the number to the right of the decimal. Ignoring, those numbers is consistent with the definition of percentile rank.

---

*Prepared by Boyd Robinson and sent to participating schools.

OTHER CONSIDERATIONS - Student scores on this interest inventory should be compared with the scores on the agriculture scale of the Ohio Vocational Interest Inventory (OVIS). Scores on the agriculture scale of OVIS can provide evidence of the overall interest in agriculture for a particular student relative to his interests on other scales of OVIS.

While determining student interest on a particular scale of the preference survey relative to other students on the same scale is valuable, perhaps the most valuable aspect of the agriculture interest inventory is a comparison of student scores on a particular scale relative to his own scores on the other six scales. That is, a comparison of the raw score on the agribusiness scale to the raw score on the ornamental horticulture scale (or one of the other scales) for a given student can be particularly meaningful in assessing the nature of that student's interest in agriculture.

With regard to curriculum and program planning, section two of the Local School Report can be valuable. A summary of all students' interest may be easily generated. (Such a summary, however, is not provided.) Student summaries by category for each of the scales can provide insight into what areas of instruction (corresponding to the scales) that students have indicated the most interest in.

MICHIGAN OCCUPATIONAL PREFERENCE SURVEY IN AGRICULTURE

INTERPRETATION OF STUDENT REPORT*

As you have probably noted on the Student Report, your scores are reported by scales. Each scale refers to a group of occupations within the broad area of agriculture. A description including example job titles for each scale or group of occupations can be found on the following page.

REFERENCE GROUP - The Reference Group is the group which your scores are compared to in order to determine your percentile ranking. The reference group for this survey is 140 Michigan Tenth Grade Students enrolled in Vocational Agriculture. Your percentile rank for each scale (found in the last column of the Student Report) indicates the percentage of the reference group that you scored above. For example, if your percentile ranking for Agribusiness was 85.7, then you ranked in the eighty-fifth percentile (ignore the number to the right of the decimal). That is to say your scale score for Agribusiness was higher than eighty-five percent of the reference group scores which indicate that your interest in Agribusiness was stronger than 85% of the reference group. You can tell what the average score for the reference group was by looking in the first column following the Scale Name and Number entitled Median Scale Score. You may compare your scale score for each scale to the median (average) scale score to see if you are above or below the average in your interests.

OCCUPATIONAL PREFERENCE PROFILE - The Occupational Preference Profile on the Student Report is broken down into the following categories (A) Dislike to do very much, (B) Dislike to do, (C) Uncertain, (D) Like to do, (E) Like to do very much. Your raw scale score for each scale is found under the category in which the score falls. For example, if you had a raw score of 18 on the Agribusiness scale it would fall in Category E, "Like to do very much" indicating strong interest in the Agribusiness area. If your scale score for a particular scale is found under Category A, you probably would dislike to do work in that area very much. By looking to see which category each scale score falls under, you may determine whether you would probably like to do work (hold a job in that area.

STEPS IN INTERPRETING - You may use the following as a rough guide in the interpretation of your scores. If you have questions about any of the steps please see your Vo-Ag teacher for help.

1. Find out which scale scores fall in Category E "Like to do very much". If you have more than one in Category E find out which has the highest percentile rank. The one with the highest percentile rank will probably be your area of strongest interest.

2. Next do the same as in (1) above for scale scores in Category D "Like to do".

3. By looking only at those scales for which your scale scores fall in Category D or E, you will have identified those areas of Agriculture that you display the strongest interest in.

4. If you only have one scale score in Category D or E your task is simplified. That scale score identifies the scale representing your area of strongest interest. You may look on the description of the scales or occupational group on the last page to see which jobs may interest you most. CAUTION - The Description of Occupational Groups list only a few examples for each area.

5. If you have more than one scale score in Categories D and E, your interests are broader and encompass more than a single area within Agriculture. You may wish to look at each scale for which you find a scale score in Category D and E. To do this look up each scale or occupational group on the last page, and see which jobs interest you most. Again, CAUTION only examples of jobs are given.

6. If you have more than one scale score in Categories D and E, you may wish to "combine" two or more of the scales. That is, you may wish to ask yourself what kind of job would require interests in two or more areas that I am strongest in. For example, if your scale scores for Ornamental Horticulture and Agribusiness are found under Categories D and/or E, you may wish to consider Garden Center employee as a job possibility because interest in both Ornamental Horticulture and Agribusiness would be helpful in such a job. Other job possibilities are possible with the combination of Ornamental Horticulture and Agribusiness.

7. If you have no scale scores falling into Category D and/or E, you may wish to look at scores in Category C "Uncertain" in the manner outlined in Steps 1-6 above. If your highest scale score or scores fall into Category C "Uncertain", it does not mean you lack interest in the agriculture area, only that any interest that you have is undecided.

8. Of course, you can find out job possibilities which you would probably not like to do by looking at scale scores that fall in Category A, "Dislike to do very much" and then looking at the last page for examples of jobs in the scales you identified.

9. Your Occupational Preference Profile can also be used to help you decide which areas of agriculture you may wish to seek additional education or training in at the high school or post-secondary level.

10. The Occupational Preference Survey is designed to help you make educational and career decisions. Even so, there are many factors to be considered of which your interests are but one. Your scores on the scales can help you make decisions but the scores cannot tell you which career or educational decision is right for you.

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*Prepared by Boyd Robinson and sent to participating students.

DESCRIPTION OF MICHIGAN OCCUPATIONAL PREFERENCE SURVEY SCALES OR OCCUPATIONAL GROUPS*

1. AGRIBUSINESS - A range of occupations dealing with the sale of supplies such as feeds, fertilizers, etc. and providing services to the production areas of agriculture such as farming. Agribusiness occupations further deal with the preparation of agricultural products for sale and the sale of supplies and services to the consuming public. Examples of jobs in the Agribusiness area include grain elevator employee, farm store employee, farm implement salesman, garden center employee, feed, seed, or fertilizer salesman, etc.

2. CONSERVATION - A range of occupations dealing with the conservation and/or improvement of natural resources including air, water, soil, forests, fish and plants. Examples of jobs in the Conservation area include park worker, fish hatchery employee, conservation aide, forest aide, etc.

3. FORESTRY - A range of occupations dealing with the many uses of forests and forest lands including their management and protection. Examples of jobs in the Forestry area include forest worker, tree service worker, loggers, saw mill employee, forest aide, etc.

4. AGRICULTURE MECHANICS - A range of occupations dealing with the selection, sales, services, operation, maintenance, and repair of agricultural machinery, equipment, structures, utilities and power systems as well as the mechanics of soil and water management. Examples of jobs in the Agriculture Mechanics area include agricultural equipment salesman, agricultural equipment set-up man, agricultural equipment mechanics, farm equipment operator, rural electricians helper, etc.

5. ORNAMENTAL HORTICULTURE - A range of occupations dealing with the culturing of ornamental plants and the establishment, maintenance, operation, and management of horticulture enterprises. Sub-areas of Ornamental Horticulture include arboriculture, floriculture, greenhouse operation and management, landscaping, nursery operation and management, and turf management. Examples of jobs in the Ornamental Horticulture area include tree service worker, flower shop employee, greenhouse employee, landscape gardener, garden center employee, nursery worker, golf course employee, etc.

6. PRODUCTION AGRICULTURE - A range of occupations dealing with the production of various agricultural commodities. Examples of jobs in the Production Agriculture area include farm operator, farm worker, pet shop attendant, custom equipment operator, vegetable grower, etc.

7. WILDLIFE - A range of occupations dealing with the preservation, management, protection, and improvement of wildlife such as game, fowl, and fish. Examples of jobs in the Wildlife area include animal caretaker, game farm worker, fish hatchery worker, etc.

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*Prepared by Boyd Robinson and sent to participating students.

MICHIGAN OCCUPATIONAL PREFERENCE

SURVEY IN AGRICULTURE

STUDENT REPORT*

STUDENT NAME GRADE LEVEL XX

SCHOOL STUDENT NUMBER XXXX

REFERENCE GROUP - MICHIGAN TENTH GRADE STUDENTS ENROLLED IN VOC. AGRI.

YOUR SCALE SCORE AND
OCCUPATIONAL PREFERENCE PROFILE

SCALE NAME AND NUMBER	MEDIAN SCALE SCORE	DISLIKE TO DO VERY MUCH (A)	DISLIKE TO DO (B)	UNCERTAIN (C)	LIKE TO DO (D)	LIKE TO DO VERY MUCH (E)	PERCE TIL RAN
1. AGRIBUSINESS	X			X			XX.X
2. CONSERVATION	X				X		XX.X
3. FORESTRY	X			X			XX.X
4. AGRICULTURE MECHANICS	X		X				XX.X
5. ORNAMENTAL HORTICULTURE	X					XX	XX.X
6. PRODUCTION AGRICULTURE	XX	X					XX.X
7. WILDLIFE	X		X				XX.X

TO THE STUDENT

THE PURPOSE OF YOUR TAKING THE MICHIGAN OCCUPATIONAL PREFERENCE SURVEY AGRICULTURE WAS TO ASSIST YOU IN DETERMINING WHICH GROUP OR GROUPS OF AGRICULTURAL OCCUPATIONS YOU LIKE TO DO. IN ORDER FOR YOU TO UNDERSTAN JUST WHERE YOUR INTERESTS IN AGRICULTURE LIE, YOU WILL NEED SOME HELP INTERPRETING THE ABOVE SCORES. YOU WILL FIND ON THE FOLLOWING PAGE AN EXPLANATION OF THE SCALES, SCALE SCORES, AND THE OCCUPATIONAL PREFEREN PROFILE WHICH SHOULD HELP YOU IN INTERPRETING YOUR SCORES. IF YOU NEED FURTHER HELP IN INTERPRETING YOUR SCORES, PLEASE SEE YOUR VOCATIONAL AGRICULTURE TEACHER OR YOUR SCHOOL COUNSELOR.

YOUR SCORES ON THE VARIOUS SCALES SHOULD PROVIDE YOU WITH INFORMATION ASSIST IN MAKING PRESENT AND FUTURE CAREER DECISIONS. WE HOPE THAT YOUR SCORES WILL HELP YOU TOWARD A REWARDING CAREER.

*Computer generated form developed by Boyd Robinson to report student MOPSA scores and sent to participating students.

MICHIGAN OCCUPATIONAL PREFERENCE

SURVEY IN AGRICULTURE

LOCAL SCHOOL REPORT*

NAME OF SCHOOL:

DATE:

DATE OF TESTING: Nov. 1974

NUMBER OF STUDENTS TESTED: ___

NUMBER OF STUDENTS TESTED BY GRADE LEVEL

___ EIGHTH GRADE ___ NINTH GRADE ___ TENTH GRADE

___ ELEVENTH GRADE ___ TWELFTH GRADE ___ OTHER

REFERENCE GROUP - MICHIGAN TENTH GRADE STUDENTS ENROLLED IN VOCATIONAL AGRICULTURE (SAMPLE OF 140)

		REFERENCE GROUP PARAMETERS			RANGE OF RAW SCORES BY INTEREST CATEGORY				
	SCALE NAME AND NUMBER	MEDIAN SCALE SCORE	MEAN SCALE SCORE	STANDARD DEVIATION	DISLIKE TO DO VERY MUCH A	DISLIKE TO DO B	UNCERTAIN C	LIKE TO DO D	LIKE TO DO VERY MUCH E
1. 1.	AGRIBUSINESS	2	1.993	9.552	(-28 : -6)	(-5 : 0)	(1 : 4)	(5 : 9)	(10 : 28)
2. 2.	CONSERVATION	0	.343	9.104	(-28 : -7)	(-6 : -2)	(-1 : 2)	(3 : 8)	(9 : 28)
3. 3.	FORESTRY	6	5.243	8.496	(-28 : -1)	(0 : 4)	(5 : 7)	(8 : 12)	(13 : 28)
4.	AGRICULTURE MECHANICS	8	7.007	10.290	(-28 : -1)	(0 : 5)	(6 : 12)	(13 : 15)	(16 : 28)
5.	ORNAMENTAL HORTICULTURE	0	-.207	10.577	(-28 : -8)	(-7 : -3)	(-2 : 2)	(3 : 10)	(11 : 28)
6.	PRODUCTION AGRICULTURE	11	10.150	9.413	(-28 : 3)	(4 : 7)	(8 : 13)	(14 : 18)	(19 : 28)
7.	WILDLIFE	7	6.800	9.784	(-28 : -1)	(0 : 5)	(6 : 9)	(10 : 16)	(17 : 28)

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*Computer generated report form developed by Boyd Robinson for reporting (MOPSA) score and statistics to local schools.

LOCAL SCHOOL REPORT (Cont.)

PERCENTILE RANKINGS OF TENTH GRADE REFERENCE GROUP FOR SEVEN SCALES*

RAW SCORE	1	2	3	4	5	6	7
-28	.00	.00	.00	.00	.00	.00	.00
-27	.00	.00	.00	.00	.71	.00	.00
-26	.00	.00	.00	.00	.71	.00	.00
-25	.	.00	.00	.00	.71	.00	.00
-24	.71	.71	.71	.00	.71	.00	.00
-23	1.43	.71	.71	.00	.71	.00	.00
-22	1.43	.71	.71	.00	.71	.00	.71
-21	1.43	.71	.71	.00	.71	.00	.71
-20	1.43	.71	.71	.00	1.43	.00	.71
-19	1.43	.71	.71	.00	2.14	.00	.71
-18	2.14	1.43	1.43	.71	2.85	.00	.71
-17	2.14	3.57	1.43	.71	4.29	.71	.71
-16	2.14	4.29	2.14	1.43	5.00	1.43	.71
-15	2.14	4.29	2.14	2.14	7.14	2.14	1.43
-14	2.86	5.00	2.14	2.85	7.86	2.14	1.43
-13	3.57	7.14	2.14	2.86	8.57	2.14	1.43
-12	4.39	7.86	2.14	4.29	11.43	2.14	1.43
-11	6.43	8.57	2.86	5.00	14.29	2.14	1.43
-10	9.29	12.14	4.29	5.71	15.71	2.14	2.14
-9	10.71	14.29	4.29	7.14	17.14	2.86	3.57
-8	14.29	15.71	5.00	8.57	19.29	3.57	6.43
-7	17.14	18.57	5.00	8.57	27.14	3.57	7.86
-6	17.86	20.71	5.71	10.71	29.29	4.29	10.00
-5	20.00	22.14	7.14	12.86	34.29	6.43	11.43
-4	21.43	25.71	10.00	14.29	37.14	6.43	12.14
-3	23.57	31.43	12.14	15.00	38.57	6.43	15.00
-2	28.57	37.86	15.71	16.43	42.86	7.86	16.43
-1	33.47	41.43	17.86	17.86	47.14	10.00	19.29
0	36.43	47.14	22.86	22.14	49.29	10.71	20.71
1	40.00	50.00	28.57	25.71	52.14	12.86	22.14
2	46.43	55.71	31.43	30.00	57.14	16.43	27.14
3	50.00	60.71	33.57	32.96	61.43	18.57	30.71
4	58.57	62.14	35.00	34.29	65.71	22.14	36.43
5	65.00	67.85	43.57	38.57	71.43	22.85	39.29
6	70.71	71.43	47.86	43.57	73.57	25.71	43.57
7	73.57	75.00	53.57	45.71	75.71	32.14	48.57
8	75.00	78.57	60.71	47.85	77.86	40.00	54.29
9	77.14	82.14	66.43	50.71	79.29	43.57	56.43
10	80.00	83.57	70.71	54.29	79.29	44.29	60.71
11	82.14	87.86	73.57	56.43	80.71	47.86	64.29
12	83.57	90.00	75.71	58.57	83.57	52.86	69.29
13	85.71	90.71	80.00	66.43	89.29	55.71	71.43
14	87.86	92.14	84.29	71.43	90.00	60.71	72.86
15	90.71	94.29	85.71	75.71	91.43	65.00	75.71
16	92.14	95.71	89.29	80.71	92.14	68.57	79.29
17	92.14	96.43	9..43	82.86	92.86	72.86	81.43
18	93.57	96.43	96.43	86.43	94.29	78.57	82.14
19	95.00	96.43	97.14	88.57	95.71	83.57	85.71
20	95.71	96.43	97.86	88.57	95.71	86.43	90.71
21	96.43	97.86	98.57	91.43	96.43	87.14	93.57
22	97.14	100.00	98.57	91.43	97.14	87.14	95.00
23	97.14	100.00	98.57	92.86	97.14	90.00	95.71
24	98.57	100.00	98.57	96.43	97.86	92.86	97.14
25	99.29	100.00	98.57	97.86	97.86	93.57	98.67
26	100.00	100.00	98.57	98.57	97.86	96.43	100.00
27	100.00	100.00	98.57	99.29	99.29	96.43	100.00
28	100.00	100.00	99.29	100.00	100.00	99.29	100.00

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*Computer generated report form developed by Boyd Robinson for reporting (MOPSA) score and statistics to local schools.

LOCAL SCHOOL REPORT (Cont.)

SCHOOL

DATA - STUDENT SCALE SCORES**

STUDENT NAME	STUDENT NUMBER	GRADE LEVEL	RAW SCORES BY SCALE*						
			1	2	3	4	5	6	7
			AGRIBUSINESS	CONSERVATION	FORESTRY	AGRICULTURE MECHANICS	ORNAMENTAL HORTICULTURE	PRODUCTION AGRICULTURE	WILDLIFE
	01	10	-11 (a)	-6 (B)	15 (E)	5 (B)	-16 (A)	21 (E)	5 (B)
	02	10	0 (B)	-1 (C)	-11 (A)	17 (E)	-15 (A)	-15 (A)	-7 (A)
	03	10	-5 (B)	14 (E)	16 (E)	2 (B)	14 (E)	11 (C)	28 (E)
	04	10	12 (E)	13 (E)	10 (D)	4 (B)	7 (D)	19 (E)	14 (D)
	05	10	9 (D)	-1 (C)	-3 (A)	-2 (A)	-13 (A)	17 (D)	10 (D)
	06	11	-8 (A)	13 (E)	23 (E)	3 (B)	10 (D)	17 (D)	17 (E)
	07	11	-5 (B)	-12 (A)	-7 (A)	11 (C)	-13 (A)	-2 (A)	2 (B)
	08	11	-24 (A)	-28 (A)	-8 (A)	28 (E)	-28 (A)	6 (B)	-12 (A)
	09	10	11 (E)	4 (D)	-1 (A)	-3 (A)	-3 (B)	17 (D)	5 (B)
	10	10	3 (C)	10 (E)	7 (C)	18 (E)	-3 (B)	25 (E)	19 (E)
	11	10	4 (C)	4 (D)	8 (D)	14 (D)	4 (D)	19 (E)	19 (C)
	12	12	1 (C)	-5 (B)	1 (B)	12 (C)	-15 (A)	0 (A)	7 (C)
	13	10	1 (C)	12 (C)	9 (D)	19 (E)	-8 (A)	16 (B)	28 (C)
	14	12	1 (C)	5 (D)	4 (B)	-1 (A)	8 (C)	22 (E)	2 (B)
	15	10	5 (D)	10 (E)	12 (D)	15 (D)	3 (D)	26 (E)	18 (E)
	16	10	3 (C)	[illegible] (D)	14 (E)	18 (E)	4 (D)	13 (C)	19 (E)

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*The alphabetic characters following the raw score indicate the interest category in which a given raw score is located: A=DISLIKE TO DO VERY MUCH; B=DISLIKE TO DO; C=UNCERTAIN; D=LIKE TO DO; and E=LIKE TO DO VERY MUCH.

**Computer generated report form developed by Boyd Robinson for reporting (MOPSA) score and statistics to local schools.

APPENDIX I

THE OHIO VOCATIONAL INTEREST SURVEY (OVIS)
SAMPLE REPORTS: STUDENT REPORT FOLDER AND SUMMARY REPORT

Pages 420 through 424 of the original document, containing the Ohio Vocational Interest Survey sample reports, are copyrighted and therefore not available.

APPENDIX J

PROJECT ADVISORY COUNCIL MEMBERS

Names, Titles, and Addresses of Advisory Council Members

Dr. Lee O. Baker, Chairman
Agriculture Department
Western Michigan University
Kalamazoo, Michigan 49001

Mr. Steven Bolen, Co-Owner/Mgr.
Weaver and Ling, Inc.[a]
South Centerville Road
Sturgis, Michigan 49091

Mr. Norwin Braun, Teacher of
Vocational Agriculture
Chesaning Union High School
850 North Fourth Street
Chesaning, Michigan 48616

Mr. Grant Fettig, Teacher of
Vocational Agriculture
Grant High School
State Street
Grant, Michigan 49327

Mr. Clifford Jump, Principal
Calhoun Area Skill Center
475 East Roosevelt
Battle Creek, Michigan 49017

Mr. Ted Myers, Vice-President
Cottage Gardens, Inc.[b]
South Waverly Road
Lansing, Michigan 48910

Mr. Ray Moriartey, Superintendent
Marlette Community Schools
3051 Moore Street
Marlette, Michigan 48453

Mr. Elton R. Smith, President
Michigan Farm Bureau
7373 West Saginaw
Lansing, Michigan 48917

Mr. Benjamin Standen
Dean for Technologies
Lake Michigan College
711 Britain Street
Benton Harbor, Michigan 49022

Mr. E. A. Wenner, Secretary-Manager
Michigan Agricultural Conference
921 North Washington
Lansing, Michigan 48906

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[a] Retail Farm Machinery Dealership.

[b] Wholesale Nursery.

APPENDIX K

TEACHERS OF VOCATIONAL AGRICULTURE WHO ASSISTED IN COLLECTION OF FIELD DATA

Names and School Addresses of Teachers Who Assisted

Mr. Richard Barnes
Merrill High School
555 West Alice Street
Merrill, Michigan 48637

Mr. Raymond J. Clark
Grand Ledge High School
225 West Kent Street
Grand Ledge, Michigan 48837

Mr. Frank Corrin
Corunna High School
Comstock Street
Corunna, Michigan 48817

Mr. Grant Fettig
Grant High School
State Street
Grant, Michigan 49327

Mr. Ronald Hesche
Hamilton Community School
136th Street
Hamilton, Michigan 49419

Mr. David Keller
South Lyon High School
61526 West Nine Mile
South Lyon, Michigan 48178

Mr. Marlin King
Colon Community Schools
606 Dallas Street
Colon, Michigan 49040

Mr. Joe V. Klier
Southeast Oakland Vo-Ed Center
5055 Delemere
Royal Oak, Michigan 48073

Mr. Russell Latchaw
Fennville High School
North Maple Street
Fennville, Michigan 49408

Mr. James LeCureaux
Ubly High School
2020 Union Street
Ubly, Michigan 48475

Mr. Keats Rasmussen
Central Montcalm High School
1480 South Sheridan Road
Stanton, Michigan 48888

Mr. Stephen E. Sapp
(No school)
1646I Spartan Village
East Lansing, Michigan 48823

Mr. Robert J. Thomas
Hartford High School
208 East Main
Hartford, Michigan 49029

Mr. Jacob G. Venema
Blissfield High School
630 South Lane Street
Blissfield, Michigan 49228

APPENDIX L

SCHOOLS THAT PARTICIPATED IN THE STUDENT INTEREST SURVEYS

Participant Schools in Both the Michigan Occupational Preference Survey in Agriculture (MOPSA) and the Ohio Vocational Interest Survey (OVIS)

Alpena High School
3303 South Third Street
Alpena, Michigan 49707

Chesaning Union High School
850 North Fourth Street
Chesaning, Michigan 48616

Hemlock High School
733 North Hemlock Road
Hemlock, Michigan 48626

West Ottawa High School
1024 North 136th Avenue
Holland, Michigan 49423

Participant Schools in the Ohio Vocational Interest Survey (OVIS) Only[a]

Battle Creek Central High School
100 West VanBuren
Battle Creek, Michigan 49017

Bridgeport High School
6335 Dixie Highway
Bridgeport, Michigan 48722

Grand Haven High School
900 Cutler Avenue
Grand Haven, Michigan 49417

Hudsonville High School
5037 32nd Avenue
Hudsonville, Michigan 49426

Pontiac Central High School
300 West Huron Street
Pontiac, Michigan 48053

Arthur Hill High School[b]
3115 Mackinaw
Saginaw, Michigan 48602

Saginaw High School[b]
3100 Webber
Saginaw, Michigan 48601

St. Charles High School
881 West Walnut
St. Charles, Michigan 48605

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[a] Schools which did not offer reimbursed programs of instruction in vocational agriculture--at least not at the tenth grade level.

[b] The students enrolled in vocational agriculture at the Saginaw Career Opportunities Center also completed the MOPSA. However, because they were enrolled at the eleventh and twelfth grade level their survey results were excluded from this report. Saginaw Arthur Hill and Saginaw High School are feeder schools to the Saginaw Career Opportunities Center, the area center for the Saginaw Public Schools.

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GLOSSARY

GLOSSARY

The definitions which follow indicate how key terms were used in this report. Although the writer has borrowed heavily from definitions used by others, their terminology does not necessarily reflect standard meanings used elsewhere.

Agricultural Education: Synonymous with Agribusiness and Natural Resources Education. Broadly defined as:

> An organized instructional program involving the combination of the agricultural production and management operations and associated services, the manufacturing and distribution of agricultural equipment and supplies, the processing, storage, marketing, and distribution of food, fiber, and other agricultural commodities, the environmental protection and wise use of renewable natural resources including air, forest, water, soil, animal, marine, and plant life and recreational resources, also involving associated education and research in all these areas.[1]

Career Education Planning District (CEPD): A group of educational agencies, including a K-12 school district, community college district, and intermediate school district, in geographic proximity to each other which are organized to establish, coordinate, and promote career education programs within their CEPD boundaries. Michigan is divided into 49 CEPDs.

Community Type: Refers to the five-category classification system established in 1971 by the Michigan Department of Education to classify Michigan school districts on the basis of major community type served. Using 1970 U.S. census data, all Michigan school districts were classified according to the five community types defined below:[2]

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[1] The same terms were used to define "Agribusiness Education" in a report from a national seminar for agricultural education held in Denver, Colorado during May 11-14, 1971. See American Vocational Association, Transitions in Agricultural Education Focusing on Agribusiness and Natural Resources Occupations (Washington, D.C.: American Vocational Association, 1971), p. 9.

[2] Michigan Department of Education, Local District and School Report: Explanatory Materials, the Third Report of the 1972-73 Michigan Educational Assessment Program (Lansing: Michigan Department of Education, April 1973), pp. 31-32.

1. Metropolitan Core City: This type (henceforth referred to as Metro-core) must meet at least one of the following criteria: (1) the community is the central city of a Michigan Standard Metropolitan Statistical Area; (2) the community is an enclave within the central city of a Michigan Standard Metropolitan Statistical Area; and/or (3) the community was previously classified as a Metropolitan Core City.

2. City: A community with a population of 10,000 or more which has not been classified as Metro-core or Urban Fringe.

3. Town: A community with a population of 2,500 to 9,999. Rural communities impacted by large military installations nearby are also classified as Towns.

4. Urban Fringe: A community, regardless of its size, which meets at least one of the following criteria: (1) the mailing address of the community is a Metro-core area or a City unless it is on a RFD route; (2) the community is within ten miles of the center of a Metro-core area; or (3) the community is within five miles of the center of a City.

5. Rural: A community with a population of less than 2,500 or if their address is an RFD route of a Town, City, Urban Fringe, or Metro-core, and they lie outside the perimeter defined above under Urban Fringe.

Competency: A brief statement describing a measurable knowledge or skill which an employee within a specific job title would be expected to perform at a predetermined level of proficiency.

Farmer: A person who works on, or operates, a farm. The term "farmer" includes both farm operators and farm laborers; also known as (farm) "worker".

Full-time Worker: A person who works 150 days or more per year on the job surveyed.

Industry: "A department or branch of a craft, art, business, or manufacture."[3]

Local Education Agency (LEA): Public educational agencies having administrative control and direction of vocational education programs such as community colleges, four-year institutions, intermediate school districts, or secondary schools.[4]

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[3] Webster's New Collegiate Dictionary, 1974.

[4] Michigan Department of Education, Michigan State Plan for Vocational Education 1974-75 (Lansing: The Michigan Department of Education, 1974), p. 3.

Manpower Needs: The kind and number of personnel which employers claim they need and whose salaries they are willing and capable of paying if the personnel sought would avail themselves for such employment. Because most manpower needs in the study are projected, instead of immediate, they are further defined as being somewhat above "effective demand" (would definitely employ) and below "desirable needs" (would be nice to have).

Occupation: "The principle business of one's life; an activity in which one engages."[5]

Occupational Cluster: Refers to a group of closely related occupations. Four major occupational clusters were selected for this study and are described by agricultural competencies required, and occupations included,[6] in the definitions which follow:

1. Agricultural Production: Skills in and knowledge of the production and propagation of animals (land and aquatic), animal products, plants (crops and ornamental), plant products, and forests and forest products; and provision of services associated with agricultural production.[7] This cluster includes farm management advisors, agricultural production scientists, farmers (owners and tenants), farm managers, farm foremen, farm laborers (both wage workers and unpaid family workers), farm service laborers (self-employed) and other persons in the agricultural production industry whose occupations require competencies in agriculture.
2. Environmental Horticulture:[8] Skills in and knowledge of aspects of arboriculture, greenhouse, nursery, landscaping, and other environmental horticulture operations. This cluster includes scientists in the horticulture services, gardeners and groundskeepers (excluding farm), retail florists, and other persons in the arboriculture, bedding plants, garden center, landscaping, nursery production, and turf and sprinkler industries whose occupations require competencies in horticulture.

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[5] Webster's New Collegiate Dictionary, 1974.

[6] The occupations included in the four major clusters were selected from the U.S. Department of Agriculture, Economic Research Service, Employment in Agriculture and Agribusiness Occupations: Region 5, ERS-575 (Washington, D.C.: Government Printing Office, October, 1974), pp. 34-43; 83-88.

[7] U.S. Department of Agriculture, Economic Research Service, Employment in Agricultural and Agribusiness Occupations, ERS-570 (Washington, D.C.: Government Printing Office, August, 1974), p. 65.

[8] Representatives of the horticulture industry in Michigan indicated that the term "Environmental Horticulture" was preferred to "Ornamental Horticulture" when describing horticultural industries and occupations that included arboriculture.

3. *Farm Implement Repair*: Skills in and knowledge of design, installation, repair, operation, and service of machinery, equipment and power sources used in agricultural production. This group includes farm implement repairmen and other persons in the hardware and farm machinery and equipment industries whose occupations require competencies in farm implement repair.

4. *Biological-Technical Services in Agriculture*: Skills in and knowledge of (1) the inspection, monitoring (quality control), processing of consumable supplies used in the production of animals and plants and their products and primary by-products used for human consumption; (2) the care of animals under treatment; and (3) the activities involved in the treatment of waste and water supplies for agricultural, domestic, industrial, and recreational purposes. This cluster includes food scientists, agricultural and biological technicans (excluding health), veterinary assistants and other persons in the food processing, animal laboratory, agricultural chemicals, water resources, waste disposal, and grain, feed, and seed service industries whose occupations require competencies in applying biological and chemical principles to agriculture.[9]

Secondary Area Vocational Center: A facility (usually referred to as an Area Center) which serves to expand the vocational education opportunities of participating K-12 districts.[10]

Successful Completion: An individual who has completed at least two semesters of high school vocational agriculture beyond the ninth grade and has either graduated or left school without graduating. Successful completion assumes the individual has acquired at least the minimum competencies needed for employment in a particular area of agriculture.

Task: "An assigned piece of work often to be finished within a certain time."[11]

Vocational Agriculture: Vocational education in agriculture of less than college grade. Only those secondary level programs of instruction in agriculture which qualify for reimbursement under the Smith-Hughes Act of 1917 and its subsequent acts, including the Vocational Education Act of 1963 and its 1968 and 1972 amendments, are included in this definition.

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[9] Occupations in the waste disposal and water resources industries were not included in USDA, ERS-575.

[10] Michigan Department of Education, *Michigan State Plan for Vocational Education 1974-75* (Lansing: The Michigan Department of Education, 1974), p. 1.

[11] *Webster's New Collegiate Dictionary*. 1974.

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